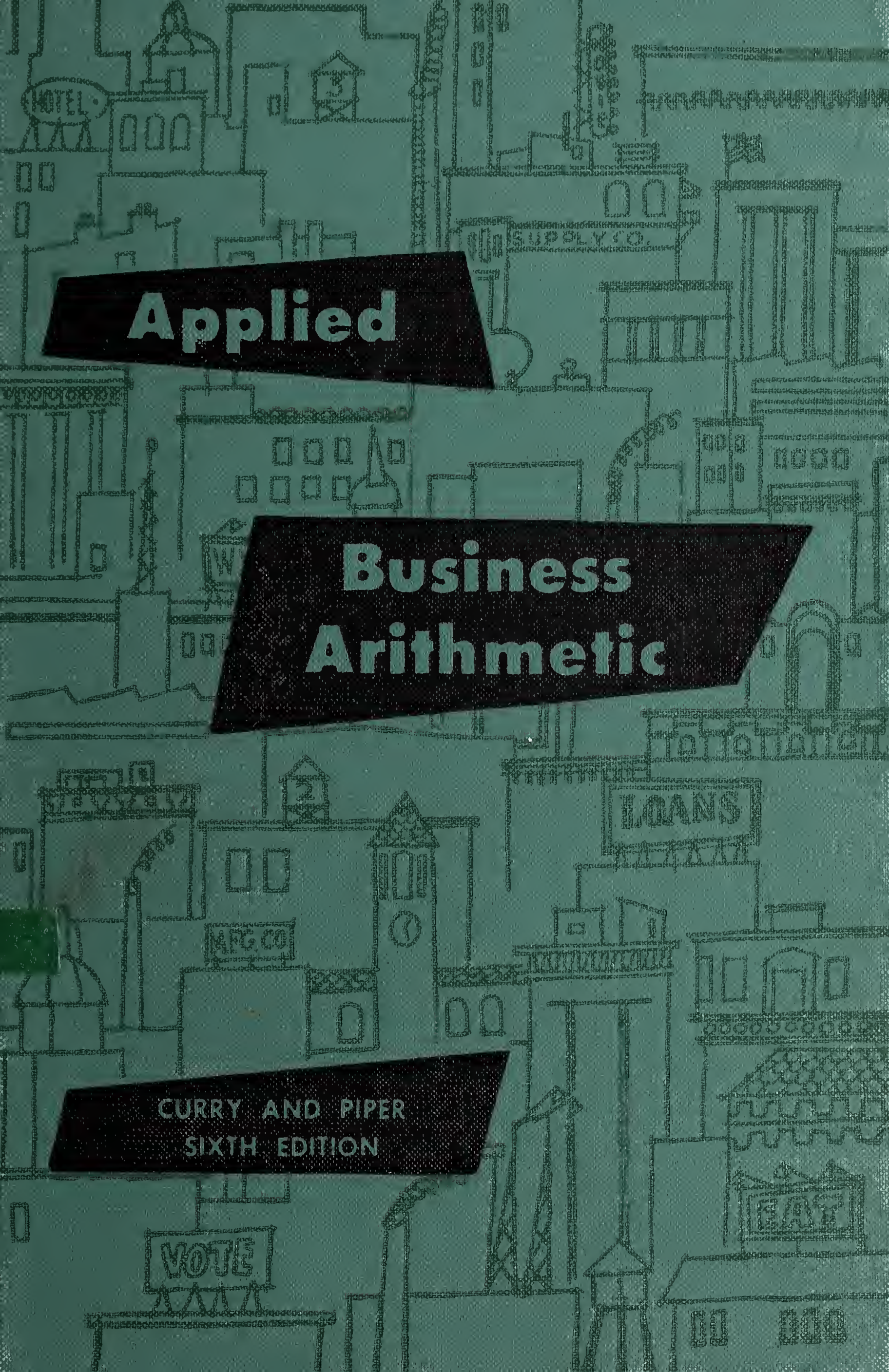

Applied Business Arithmetic

CURRY AND PIPER

SIXTH EDITION

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APPLIED BUSINESS ARITHMETIC

FOR PERSONAL AND BUSINESS USE

Sixth Edition

by
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Published by
SOUTH-WESTERN PUBLISHING COMPANY
Cincinnati 27 Chicago 5 Dallas 2 San Francisco 3 New Rochelle, N. Y.

M85

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SOUTH-WESTERN PUBLISHING COMPANY
Cincinnati, Ohio
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PREFACE

In this sixth edition of APPLIED BUSINESS ARITHMETIC, the problem material throughout the book has been thoroughly revised to reflect the changes that have taken place in commodity prices, wage rates, production costs, and other elements in the national economy since the publication of the preceding edition. In addition, many new problems have been supplied, factual data brought up to date, and discussions and illustrative examples modified to conform with changes in business practices. Although some changes have been made in the organization of the subject matter, teachers familiar with the preceding edition will observe that all of the features which contributed to its popularity have been retained.

As in the preceding edition, the subject matter of APPLIED BUSINESS ARITHMETIC, Sixth Edition, is divided into carefully co-ordinated units. The beginning units develop the fundamental principles and operations by a study of personal problems faced by every individual in his daily life. Each principle or operation is introduced and developed through its application in some personal business problem with which the student is familiar. The problems used to illustrate these operations are relatively simple. Included in this part of the text are units dealing with problems of buying for personal and household needs, banking transactions, and problems in personal finance.

The principles and processes developed in the beginning units are then applied in subsequent units dealing with savings and investments, home ownership, travel and transportation, taxes, and in units devoted to problems arising in the operation of various types of business enterprise, including problems of the retailer and the farmer.

Each unit of the book is divided into correlated sections, arranged in logical order, which develop certain parts of the larger subject of the unit. Each section, in turn, is subdivided into its elemental topics, arranged in graded sequence. In this way, continuity and progressive development are maintained from topic to topic, section to section, and unit to unit.

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In general, the instruction under each topic is developed in accordance with a five-step learning pattern that provides:

(1) A functional approach for introducing the new principle or process in a meaningful, concrete manner. Each fundamental process, for example, is presented through the medium of concrete problems rather than abstract examples.

(2) A simple, concise explanatory discussion, which furnishes essential background information for a sample problem involving the new principle.

(3) A sample problem, or illustrative example, with a model solution and a detailed explanation of the solution.

(4) An exercise for immediate practice consisting of problems similar to the one in the illustrative example.

(5) A review of the problem at planned intervals to ensure retention of what the student has learned. This spaced review is provided in the problems for application and review, which are supplied at the end of each section, and in the cumulative reviews at various points in the text.

In organizing the instruction in the various sections, the authors have followed the practice of introducing new principles and types of problems in graded sequence, one at a time. Each principle or type of problem is treated under a separate topical heading with provision for immediate drill or practice in applying the new learning. This step-by-step, sequential development of the subject matter, together with the simple informative discussions and illustrative examples, enables the student to progress independently through his own efforts, with a minimum of assistance from the teacher.

A testing program accompanying the text enables the teacher to check the student's mastery at regular intervals and thereby serves as a basis for necessary remedial teaching.

The authors are indebted to many teachers, business concerns, and governmental agencies for their help in submitting suggestions and practical problems to the end that the text may serve a useful purpose.

P. E. C.
E. B. P.

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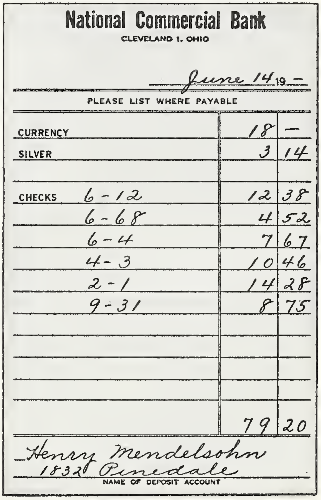
UNIT I

TRANSACTIONS WITH A BANK

Section 1 . . . Deposit Tickets

Purpose and Use of the Deposit Ticket. When a person makes a deposit in a bank, both he and the bank need a record of the transaction. The depositor therefore records his deposit on a form known as a *deposit ticket* or *deposit slip*. The depositor gives the deposit ticket, with his deposit, to the bank teller. The teller keeps this ticket and records the amount of the deposit in a book known as a *bankbook* or *passbook*. This book is kept by the depositor.



National Commercial Bank
CLEVELAND 1, OHIO

June 14 19 –

PLEASE LIST WHERE PAYABLE

CURRENCY	18	—
SILVER	3	14
CHECKS 6-12	12	38
6-68	4	52
6-4	7	67
4-3	10	46
2-1	14	28
9-31	8	75
	79	20

Henry Mendelsohn
1832 Pinedale
NAME OF DEPOSIT ACCOUNT

Deposit Ticket

Listing Items on the Deposit Ticket. Items are listed on the deposit ticket as currency, silver, and checks. The total value of all paper money is listed in one amount after the heading "Currency," and the total of all coins is listed in one amount after the heading "Silver." Checks are entered singly on the deposit ticket and may be identified by the A.B.A. transit numbers of the banks on which they are drawn.

Each bank has been assigned an American Bankers Association (A.B.A.) transit number. This number appears as the numerator of a fraction that is printed near the upper right corner of each check. (See the checks on page 5.)

Completing the Deposit Ticket. After all items have been entered on the deposit ticket, they are added, and the total is shown on the last line. It is important, of course, from the point of view of both the bank and the individual, that the amounts be added correctly.

Exercise 1. (*Written*)

Prepare the deposit ticket in each of the following problems and show the total amount deposited. If deposit tickets are not available, use blank sheets of paper about the size of a deposit ticket.

1. On July 10 Roger Freeman deposited the following items in the Union Trust Company, Rochester:

2 ten-dollar bills
1 five-dollar bill
1 half dollar
2 dimes
3 pennies
1 check for $12.50 on the Central Trust Company (50-1), Rochester.
1 check for $10 on the Syracuse Trust Company (50-42), Syracuse.

2. John Vernon, treasurer of the Brazil Boys' Club, deposited in the bank the following money and checks collected from dues:

2 five-dollar bills
1 two-dollar bill
5 one-dollar bills
9 half dollars
8 quarters
5 dimes
6 checks, each for $2, bearing the following bank transit numbers: 13-2, 13-24, 13-2, 13-1, 13-24, 13-2.

3. Mary Gill, treasurer of the Columbus Nurses' Home, has her account at the Second National Bank in Columbus, Ohio. She has the following items for deposit:

Currency and Coins	Checks for	Bank Transit Numbers
2 one-dollar bills	$25.00	2–11
5 half dollars	10.00	4–5
3 quarters	25.00	6–83
4 dimes	18.75	70–283
3 nickels	72.50	71–80

4. Matthew Kohler, treasurer of the Marion High School Junior Class, deposited at the bank the following receipts from the advance sale of tickets for the class play:

1 ten-dollar bill
2 five-dollar bills
3 two-dollar bills
37 one-dollar bills
45 half dollars
26 quarters
11 dimes
8 nickels

ADDITION

Need for Addition. Addition is required in finding the total of a deposit ticket that includes two or more items. Similarly, addition is required in many other practical personal and business problems. Adding machines are available for use in offices where long columns of figures are often added; but even in offices short problems can often be solved more quickly without an adding machine than with one. Moreover, the average person in solving his own problems does not ordinarily have access to an adding machine. It is therefore important that each person should know how to add accurately and rapidly.

Proof by Reverse Addition. The best method of proving the correctness of a total is by *reverse addition*; that is, by adding a column in the opposite direction from that in which it was originally added. As this process almost always results in new combinations of figures, it practically eliminates the danger of the same error occurring twice and thus not being discovered.

Drills for Accuracy and Speed are provided on pages 539 to 556. Five such drills for addition are given on pages 539 to 541.

Exercise 2. (Written)

Copy and add the following problems. Prove each result by reverse addition.

1.	2.	3.	4.	5.	6.	7.	8.
$10.79	$ 7.45	$98.45	$75.38	$ 8.32	$16.75	$81.85	$19.20
2.10	23.05	10.63	31.02	11.71	90.31	7.24	71.62
1.62	84.17	2.72	94.72	91.07	4.03	22.01	21.28
17.08	76.52	30.29	6.77	87.65	86.12	36.57	34.96
.33	1.88	81.84	10.23	11.32	25.97	12.32	8.12
29.05	39.40	23.36	94.57	10.13	15.83	9.21	18.52

Problems for Application and Review

1. Assume that your father is the owner of a store and that after a busy day he takes to the bank for deposit the following items. What is the total amount of the deposit?

47 pennies
29 nickels
53 dimes
33 quarters
17 half dollars

14 one-dollar bills
7 five-dollar bills
3 twenty-dollar bills

CHECKS FOR

$13.44
8.65
21.07

$10.05
3.76

2. On September 5, Steven Maxwell had $125.30 in the Farmers Trust and Savings Bank. When the bank opened that day, he made an additional deposit consisting of the following:

3 pennies
4 nickels
3 dimes
6 quarters
5 half dollars
3 one-dollar bills
4 five-dollar bills
2 ten-dollar bills

(a) What was the amount of the deposit? (b) What total amount did he have in the bank after making the deposit?

3. On Monday morning, Louis Ross, a school boy, had $1.15. During the week he received from his father his weekly allowance of $2.50. He also received $1.95 for cutting lawns in the neighborhood and $1.75 for working Friday afternoon at a gas station. (a) What was the total amount he received during the week? (b) What total amount of money did he have available to spend during the week?

4. Mr. Alec Fox, a householder, uses fuel oil for heating his home. On September 1, the fuel gauge showed 70 gallons of oil. During the heating season he purchased additional oil as follows: 200 gal.; 181 gal.; 175 gal.; 150 gal.; 195 gal.; 187 gal.; 176 gal. (a) What was the total amount of oil that he purchased during the season? (b) What was the total quantity of oil available for use?

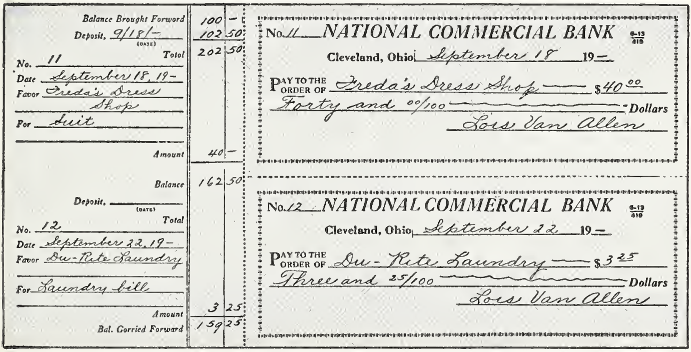
5. Mrs. Gale Long operates a boarding house. On April 1 she had 22 pounds of sugar. During the month she purchased additional quantities as follows: 25 lb., 35 lb., 20 lb., 50 lb., and 15 lb. (a) How many pounds of sugar did she purchase during April? (b) What was the total available for use during the month?

6. On September 1, Fred Rea had on hand in his oil storage tank oil that had cost him $4.10. During the heating season he purchased the following additional amounts: $17.35; $16.80; $15.65; $21.10; $15.90; $19.75; $17.25; $16.80; $18.25. (a) What was the cost of the oil purchased during the season? (b) What was the cost of all the oil available for use during the season?

7. On September 1, George Herber had on hand a quantity of coal that cost him $16.00. During the heating season he purchased additional quantities at a cost of $162.25. What was the cost of the coal available for use during the season?

Purpose of the Check Stubs. A bank depositor may write orders directing the bank to make payments for him. These orders are known as *checks.*

A bank will not honor a check for more than the customer has on deposit. It is therefore necessary that the customer keep a record of his deposits and his checks so that he will always know the balance against which checks may be written. This record is kept most commonly on the check stub, in the manner shown in the following illustration.



Balance Brought Forward	100	—
Deposit, 9/18/– (DATE)	102	50
Total	202	50
No. 11		
Date September 18, 19–		
Favor Freda's Dress Shop		
For Suit		
Amount	40	—
Balance	162	50
Deposit, (DATE)		
Total		
No. 12		
Date September 22, 19–		
Favor Du-Rite Laundry		
For Laundry bill		
Amount	3	25
Bal. Carried Forward	159	25

No. 11 NATIONAL COMMERCIAL BANK 6-13/410
Cleveland, Ohio September 18 19–
PAY TO THE ORDER OF Freda's Dress Shop $40.00
Forty and 00/100 Dollars
Lois Van Allen

No. 12 NATIONAL COMMERCIAL BANK 6-13/410
Cleveland, Ohio September 22 19–
PAY TO THE ORDER OF Du-Rite Laundry $3.25
Three and 25/100 Dollars
Lois Van Allen

Checks and Check Stubs

In the illustration given above, the first check stub shows that a balance of $100 was brought forward from the previous check stub. A deposit of $102.50 was then recorded, making the new balance $202.50. A check was drawn for $40, leaving a balance of $162.50. Later a second check was drawn for $3.25. The remaining balance, $159.25, was the net amount against which checks could be drawn.

Exercise 3. (Written)

1. Joseph Smith began the month of October with a bank balance of $100. During the month he recorded on his check stubs all deposits made and all checks issued; he did not, however, calculate the balance of his account after each transaction. The following condensed summary of his check stubs therefore shows the beginning balance, the deposits, and the checks, but no totals or balances.

Oct.	1	Balance	$100.00
	4	Deposit	10.00
		Total	?
	8	Check No. 10	42.98
		Balance	?

Oct.	15	Check No. 11	$13.50
		Balance	?
	18	Deposit	27.50
		Total	?
	29	Check No. 12	17.85
		Balance	?

Compute the total or the balance of Mr. Smith's account after each transaction.

2. On August 3 George Stone opened an account with the First National Bank by depositing $150. During the month he made the following additional deposits: $27.82; $49.68; $18.75. He wrote checks during the month for the following amounts: $3.69; $18.37; $15.45; $9.16; $35.00; $8.55; $22.82. What was the amount of his checkbook balance on August 31?

3. On Monday morning, September 5, John Park's checkbook showed a balance of $397.62. During the week he made the following deposits: $132.55; $10.19; $26.58. He issued checks for the following amounts: $7.42; $10.50; $19.96; $5.07; $37.98; $17.49; $11.89. Find the amount of his checkbook balance at the end of the week.

4. On the morning of September 2, Ray Carter's checkbook balance was $208.66. During the day he deposited $83.75 and drew checks for the following amounts: $3.75; $29.05; $13.29; $9.95; $20.44. What was the amount of his checkbook balance at the end of the day?

SUBTRACTION

Need for Subtraction. In deducting from your check-stub balance the amount of each check written, you apply the process of subtraction. In solving other personal and home problems, you will frequently find it necessary to use this process.

Proof of Subtraction. Every problem in subtraction should be proved immediately after the remainder has been found. The best proof is to add the subtrahend and the remainder. The sum should be the same amount as the minuend. A check mark may be placed at the left of the remainder to indicate that it has been proved.

See pages 542 and 543 of the Drills for Accuracy and Speed for three such drills in subtraction.

Exercise 4. (Written)

Copy and write the remainder for each of the following problems. Prove each result by adding the subtrahend and the remainder. Place a check mark at the left of the remainder to indicate the proof.

	a.	*b.*	*c.*	*d.*	*e.*
1.	4,395	21,847	$31,576.25	$45,217.37	$28,304.45
	283	3,146	2,870.48	2,807.79	4,726.28
2.	5,307	41,007	$83,700.00	$54,002.05	$10,110.10
	708	3,847	23,746.57	45,705.76	3,746.38

Problems for Application and Review

Group A

1. Richard Lewis had a balance of $135.50 in his bank account on May 1. During the month, he deposited $16.65 and withdrew $54.80. What was his bank balance at the end of the month?

2. The bank balance of Carl Rowe on the morning of September 8 was $189.32. During the day, he deposited $27.59. At the end of the day, his bank balance was $163.17. Find the amount that he withdrew from the bank during the day.

3. On September 1, the beginning of the heating season, G. M. Davis, a householder, had 3 tons of coal. During the heating season he purchased additional quantities of coal amounting to 12 tons. On June 1, the end of the season, there was 1 ton of coal in the bin. (a) How many tons of coal did he have available for use during the season? (b) How many tons did he use?

4. Bob Williams, a high school boy, has a Sunday morning paper route. Last Sunday, he sold for $17.10 newspapers that cost him $13.80. (a) How much was his *gross profit,* or the amount remaining after deducting the cost of the papers from his sales? (b) If he paid his younger brother 50 cents for helping him deliver the papers, how much was his *net profit,* or the amount remaining after deducting the 50 cents of expense from the gross profit?

5. During the summer months, Joe Bradley, a college student, conducts a roadside stand, selling soft drinks, ice cream, fruit, and candy. During last August, his total sales for the month amounted to $1,267.43. The goods that he sold cost him $764.56. (a) What was his gross profit for the month? (b) His expenses in carrying on the business of the stand were as follows: rent of the stand and equipment, $35; electricity, for electric lights and refrigerator, $12.78; supplies, consisting of paper bags, twine, ice cream cones, and similar items, $23.45; hired help, $89.50. What was the total of his operating expenses? (c) What was the amount of his net profit for the month?

Group B

1. The bank balance of John Norton on the morning of September 10 was $264.17. During the day, he deposited $58.65. At the end of the day, his bank balance was $247.75. How much did he withdraw from the bank during the day?

2. During July, the sales of Leslie Gates, owner of a cash-and-carry grocery business, amounted to $5,020.43. (a) What was the amount of his gross profit for the month if the goods he sold cost him $4,081.88? (b) If his operating expenses totaled $493.95, what was his net profit for the month?

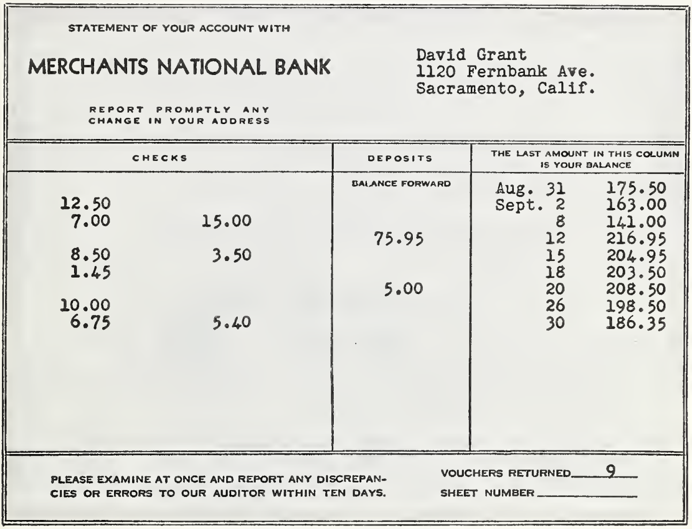
3. On September 1, James Finch had on hand a quantity of fuel oil that cost him $5.60. During the heating season he purchased additional quantities at a cost of $123.42. At the end of the season there remained in the tank oil worth $8.60. (a) What was the cost of the oil available for use during the season? (b) What was the cost of the oil used?

4. Linda Hall is the owner of the Linda Hat Shop. On March 31, at the close of the day, she took an inventory and found that she had on hand hats that cost $1,489.45. During April she purchased additional hats for $1,355.45. (a) What was the cost of the hats that she had available for sale during the month? (b) After the close of business on April 30, she had on hand a stock of hats worth $968.75. What was the cost of the hats sold during the month?

5. On the morning of April 1, Linda Hall, owner of the hat shop referred to in Problem 4, placed $10 in change in the cash register. At the close of the day, the cash register totals showed that she had taken in $121.25 and had paid out $2.86. Upon counting the cash in the cash drawer, Miss Hall found that it amounted to $128.14. (a) Was this the correct amount that should have been in the cash drawer? (b) If not, was the cash over or short? (c) How much?

Section 3 . . . Bank Statements and Reconciliations

The Bank Statement. As a general rule a bank prepares a monthly statement for each depositor. This statement, which is commonly referred to as a *bank statement,* is a copy of the bank's record of the depositor's bank account. A typical bank statement is shown in the illustration given below.



STATEMENT OF YOUR ACCOUNT WITH

MERCHANTS NATIONAL BANK

REPORT PROMPTLY ANY
CHANGE IN YOUR ADDRESS

David Grant
1120 Fernbank Ave.
Sacramento, Calif.

CHECKS		DEPOSITS	THE LAST AMOUNT IN THIS COLUMN IS YOUR BALANCE	
		BALANCE FORWARD	Aug. 31	175.50
12.50			Sept. 2	163.00
7.00	15.00		8	141.00
		75.95	12	216.95
8.50	3.50		15	204.95
1.45			18	203.50
		5.00	20	208.50
10.00			26	198.50
6.75	5.40		30	186.35

PLEASE EXAMINE AT ONCE AND REPORT ANY DISCREPANCIES OR ERRORS TO OUR AUDITOR WITHIN TEN DAYS.

VOUCHERS RETURNED 9
SHEET NUMBER ______

Bank Statement

The bank statement shows: (a) the bank balance at the end of the preceding month, (b) the deposits made during the current month, (c) the checks paid by the bank for the depositor during the month, (d) the bank's service charge for handling the account if there was such a charge, and (e) the balance after each day's transactions. The last amount in the "Balance" column represents the bank balance at the end of the month.

On the bank statement illustrated above, there are nine items in the "Checks" column. Eight of the items represent checks that were paid by the bank. The item of $1.45, dated September 18, represents the bank's service charge for handling the account for the preceding month.

Reconciling the Bank Balance. The final balance on the bank statement represents the amount of bank funds available to the depositor unless there are *outstanding checks,* that is, checks issued during the month but not yet presented at the bank for payment. Such checks cause the balance on the statement to be greater than the available bank funds. Hence, to find the amount of the available bank funds, the depositor must subtract the outstanding checks from the balance shown on the statement.

For example, on October 1, David Grant receives from his bank the statement shown on page 9, together with the canceled checks for the month of September. Upon comparing the statement and canceled checks with the record on his check stubs, he finds the following checks outstanding: Check No. 76 for $8.50 and check No. 79 for $6.75. Mr. Grant makes the following calculations to adjust the bank statement balance:

Bank statement balance			$186.35
Deduct			
Outstanding checks:			
	#76	$8.50	
	#79	6.75	15.25
Available bank funds			$171.10

If there are no errors or omissions in Mr. Grant's checkbook record, the balance on the last check stub for the month should be the same as the amount of the available bank funds. The latter, as shown above, is $171.10. Mr. Grant's checkbook balance, however, is $172.55. The difference is caused by the service charge, $1.45, which has been subtracted on the bank statement but not on his check stubs. He therefore makes the following calculations to find the correct checkbook balance:

Checkbook balance	$172.55
Deduct	
Service charge	1.45
Correct checkbook balance	$171.10

The correct checkbook balance, $171.10, is seen to be the same as the available bank funds, $171.10.

This process of bringing the bank statement balance and the checkbook balance into agreement with each other is called *reconciling the bank balance.* The calculations for reconciling the balance may be arranged in two parallel columns, in a form called a *reconciliation statement.* The reconciliation statement for David Grant is shown in the following illustration.

RECONCILIATION STATEMENT
September 30, 19--

Checkbook balance	$172.55	Bank statement balance		$186.35
Deduct		*Deduct*		
Service charge	1.45	Outstanding checks:		
		#76	$8.50	
		#79	6.75	
				15.25
Correct checkbook balance	$171.10	Available bank funds		$171.10

Reconciliation Statement for David Grant

The calculations for finding the correct checkbook balance are shown in the column at the left. The calculations for finding the available bank funds are shown in the column at the right.

Exercise 5. (*Written*)

In each of the following problems, prepare a reconciliation statement similar to the one illustrated above.

1. On August 1, Jacob Finley received from the bank his bank statement for July together with the canceled checks. According to the bank statement, his bank balance on July 31 was $247.56. His checkbook balance on the same date was $183.24. Upon comparing the canceled checks with his check stubs, he found that the following checks were outstanding: No. 81, $14.27; No. 82, $32.82; and No. 84, $18.48. Among the canceled checks he found a service-charge ticket for $1.25, which had been deducted on the bank statement but which had not been recorded in the checkbook.

2. On October 31, the balance in Harry Broderick's bank account, as shown by his bank statement, was $547.82. His checkbook showed on the same date a balance of $498.57. On comparing the canceled checks with the check stubs, he found that the following checks had not been returned by the bank: No. 180,

$26.30; No. 195, $15.80; and No. 196, $8.90. He also found that the bank had subtracted a service charge of $1.75.

3. James Cole's checkbook balance at the end of March was $593.58. His bank statement for the month of March showed a final balance of $632.17. A comparison of the checkbook with the bank statement and canceled checks revealed the following facts: The bank had deducted $.92 for a service charge which had not been recorded in the checkbook. The following checks had not been presented at the bank for payment: No. 72 for $13.62; No. 73 for $7.84; No. 77 for $15.35; and No. 79 for $2.70.

Reconciliation Statement of Wilbur Dean. The following reconciliation statement of Wilbur Dean includes several typical adjustments in addition to those necessitated by the outstanding checks and unrecorded service charge.

RECONCILIATION STATEMENT
January 31, 19--

Checkbook balance		$243.65	Bank statement balance		$239.50
Add			*Add*		
Deposit omitted	$5.00		Deposit not recorded		10.00
Amount on check stub 65 too large	1.80	6.80			$249.50
		$250.45	*Deduct*		
			Outstanding checks:		
Deduct			#63	$7.20	
Service charge	$ 1.15		#66	8.00	15.20
Counter check not recorded	15.00	16.15			
Correct checkbook balance		$234.30	Available bank funds		$234.30

Reconciliation Statement for Wilbur Dean

Explanation of Wilbur Dean's Reconciliation Statement. Upon comparing his January bank statement and canceled checks with his checkbook record, Mr. Dean found the following items which affected the bank statement balance:

A deposit of $10.00 on January 31 was made too late to appear on the January bank statement.

Checks No. 63 and 66, totaling $15.20, were outstanding.

The unrecorded deposit caused the bank statement balance to be $10.00 less than the available bank funds. The outstanding checks caused the balance to be $15.20 more than the available bank funds.

Hence, to find the amount of the available bank funds, Mr. Dean added $10.00 to the bank statement balance and from that sum subtracted $15.20. The result was $234.30, the amount of the available bank funds.

Mr. Dean also found the following errors and omissions which affected the checkbook balance:

A deposit of $5.00 on January 20 had not been recorded and added on the check stubs.

Check No. 65 for $3.50 had been recorded and subtracted on the check stub as $5.30, which was $1.80 more than the correct amount.

A service charge of $1.15 had been subtracted on the bank statement but not on the check stubs.

A counter check for $15.00, which he cashed at the bank on January 26, had not been recorded and subtracted on the stubs.

The omitted deposit and the error on the stub of check No. 65 caused the checkbook balance to be $6.80 less than the correct amount.

The unrecorded service charge and the unrecorded counter check caused the checkbook balance to be $16.15 more than the correct amount.

Hence, to find the correct checkbook balance, Mr. Dean added $6.80 to the final balance on the last stub and from that sum subtracted $16.15. Thus, the correct checkbook balance was found to be $234.30. This agrees with the amount of the available bank funds.

Exercise 6. (Written)

1. The May bank statement of Robert Wallace showed a balance of $325.43 on May 31. Upon comparing the check stubs with the items on the statement, he discovered the following facts: The checkbook showed a deposit on May 31 of $22.93, which was made too late to appear on the bank statement. The outstanding checks consisted of No. 51 for $17.08, No. 64 for $9.66, and No. 71 for $28.75. Find the amount of the available bank funds.

2. Albert Stevens' August bank statement shows a final balance of $173.48. The following checks are found to be outstanding: No. 98 for $37.50; No. 104 for $10.69; No. 105 for $3.88; No. 107 for $29.95. The checkbook record includes a deposit of $56.83, mailed on August 31, which does not appear on the bank statement. Find the amount of the available bank funds.

3. After adjusting the final balance on his March bank statement, Ralph Winslow found that his available bank funds on March 31 were $263.27. His checkbook balance on that date was $269.43. Upon comparing his checkbook record with the items on the bank statement, Mr. Winslow discovered that the following items had not been recorded in the checkbook: a check for $23.57, a deposit of $16.85, and a service charge of $1.24. He also discovered that a check for $26.80 had been recorded on the check stub as $28.60. Find the correct checkbook balance.

4. The adjusted balance of Franklin Robinson's November bank statement showed that his available bank funds on November 30 were $419.04. His checkbook balance on that date was $369.84. A comparison of the checkbook with the items on the bank statement showed that Mr. Robinson had neglected to enter on the stubs a deposit of $46.50, and that in the check-stub record of one of the checks, he had entered $58.50 instead of the correct amount, $55.80. Find the correct checkbook balance.

5. The adjusted balance of your bank statement shows that your available bank funds at the end of the month are $79.27. The final balance on your last check stub for the month is $81.37. Upon comparing your checkbook with the items on the bank statement, you find that a service charge of $1.47 appears on the bank statement but not in the checkbook record. You also find that one of the checks was issued for $5.70, whereas the amount you entered on the check stub was $5.07. Find the correct checkbook balance.

Exercise 7. (*Written*)

1. On June 1, Charles Agar received from the bank his bank statement for May together with the canceled checks. The bank balance on May 31, according to the bank statement, was $387.70. His checkbook balance on that date was $370.57. Upon comparing the statement with the checkbook, Mr. Agar found that the following items had not been recorded in the checkbook: a deposit of $15 on May 12; a service charge of $.87. The checkbook record included a deposit of $20, mailed to the bank on May 31, which did not appear on the bank statement. The following checks were found to be outstanding: No. 83 for $10; No. 87 for $8; and No. 88 for $5. Prepare the reconciliation statement.

2. Frank Bailey's bank statement for June showed a balance of $331.15 on June 30. His checkbook on that date showed a balance of $317.95. On comparing the canceled checks with his check stubs he found that the following checks had not been returned by the bank: No. 58 for $3.50; No. 62 for $7.85; No. 64 for $13.23. He also discovered that one of the canceled checks, No. 60, for $13.50, had been recorded on the checkbook stub as $15.30. The following items appeared on the bank statement but had not been recorded in the checkbook: a service charge of $1.18; a canceled check for $12. Prepare the reconciliation statement.

3. Robert Cameron's checkbook balance on July 31 was $422.90. His July bank statement showed a final balance of $401.17. A comparison of the checkbook with the items on the bank statement revealed the following facts: A deposit of $13.50 had been recorded twice in the checkbook by mistake. A deposit of $37.25 on July 31 was made too late to appear on the bank statement. The bank had deducted $.98 for a service charge which had not been recorded in the checkbook. The following checks had not been presented at the bank for payment: No. 74 for $12.25; No. 75 for $8.62; No. 78 for $9.13. Reconcile the balances.

Problems for Application and Review

Group A

1. According to his September bank statement, Robert Fisk's bank balance on September 30 was $364.27. His checkbook balance on that date was $319.02. There was a service charge of $1.14, and the following checks were outstanding: No. 236, $21.65; No. 241, $3.98; No. 244, $12.47; No. 245, $8.29. Prepare a reconciliation statement.

2. Walter Thurston, who operates a candy store, had sales amounting to $864.32 during the month of June. The cost of the goods sold was $578.59, and the operating expenses were $139.86. Find (a) the gross profit for the month and (b) the net profit.

3. After the close of business on May 31, Herman Lockrow, owner of a variety store, took an inventory and found that he had on hand a stock of merchandise that cost $3,142.50. He made additional purchases of merchandise during June amounting to $1,134.25. (a) What was the cost of the merchandise that he had available for sale during June? (b) At the close of business on June 30, he took an inventory and found that his stock of merchandise on hand amounted to $3,218.30. What was the cost of the goods that he sold during June?

4. Last Monday, Lois Cook, cashier at the Malden Food Market, had $32.50 in change in the cash register at the beginning of the day. At the end of the day, the cash register totals showed that she had taken in $639.27 and had paid out $3.42. Upon counting the money in the cash drawer, she found that she had 113 pennies, 97 nickels, 67 dimes, 76 quarters, 47 half dollars, 38 one-dollar bills, 27 five-dollar bills, 18 ten-dollar bills, and 13 twenty-dollar bills. (a) Was the cash over or short? (b) How much?

Group B

1. On May 1, Lester White received from the bank his monthly statement together with the canceled checks. According to the statement, the bank balance was $476.31. On the same day, the checkbook balance was $331.70. Upon comparing the canceled checks and the statement with the checkbook, Mr. White found that a check for $3.78 had not been entered in the checkbook, a check for $34.50 had been entered on the stub as $43.50, a deposit of $30 had not been entered in the checkbook, and the following checks were outstanding: No. 102, $69.42; No. 107, $20.62; and No. 108, $19.35. Prepare the reconciliation statement.

2. Walter Prince is the owner of the Broadway Luggage Shop. His inventory of merchandise showed a stock of merchandise amounting to $12,461.85 on October 1. His purchases during the month amounted to $2,184.95, and his sales amounted to $3,463.30. His inventory on October 31 showed $11,256.15. (a) Find the cost of goods sold during the month. (b) Find the gross profit.

3. On the morning of May 10, J. B. Vance, restaurant owner, placed $30 in change in his cash register. At the close of the day the register totals showed he had taken in $341.13 and had paid out $7.65. Upon counting the money in the cash drawer, he found that he had $363.77. How much was the cash over or short?

4. The cafeteria at the Lincoln High School bought six boxes of chocolate bars, each box containing two dozen bars, at 80¢ a box. All the bars were sold at 5¢ each. How much gross profit did the cafeteria make on the six boxes?

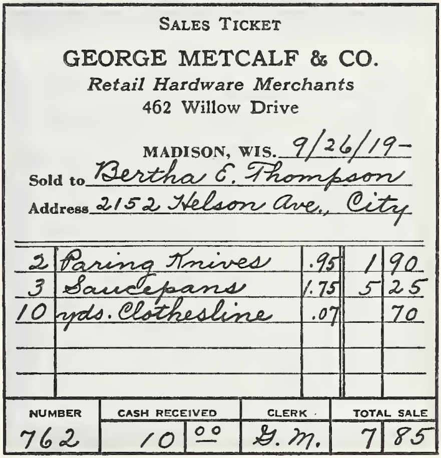
UNIT II

THE ARITHMETIC OF BUYING

Section 1 . . . Sales Tickets

Sales Tickets for Cash Sales. In many stores, when a customer makes a cash purchase, he is given a sales ticket similar to the one at the right. The ticket shows the quantity, description, unit price, and total cost for each article purchased. It also shows the total amount of the sale and the amount of money given in payment.

The clerk makes two or more copies of each sales ticket. One copy is given to the customer. The other copy or copies are retained by the clerk for the store records.



SALES TICKET

GEORGE METCALF & CO.
Retail Hardware Merchants
462 Willow Drive

MADISON, WIS. 9/26/19-
Sold to Bertha E. Thompson
Address 2152 Nelson Ave., City

2	Paring Knives	.95	1	90
3	Saucepans	1.75	5	25
10	yds. Clothesline	.07		70

NUMBER	CASH RECEIVED	CLERK	TOTAL SALE
762	10 00	G. M.	7 85

Sales Ticket

Sales Tickets for Charge Sales. If Miss Thompson, instead of paying cash, had charged the amount to her account, the clerk would have written below "Cash Received" at the bottom of the ticket the abbreviation "Chg." showing that the amount of the sale, $7.85, was to be charged to her account and to be paid at a later date. Miss Thompson would keep her copy of the sales ticket because it would help her in determining how much she owed the store at any time.

Exercise 1. (*Oral*)

Give the product of the indicated multiplication in each of the following problems.

At, often expressed as @, refers to the price of a single unit, the unit being the term in which the quantity purchased is expressed. Thus, "2 dozen eggs *at* 66¢," means at 66¢ *a dozen.* Likewise, "two pounds of fruit @ 15¢," means at 15¢ a pound. However, "two pounds of fruit, 15¢," signifies that two pounds sell for 15¢.

1. 2 doz. eggs at 66¢
2. 4 pkg. saltines at 21¢
3. 4 qt. green beans at 26¢
4. 3 doz. rolls at 24¢
5. 5 cans corn at 23¢
6. 4 lb. prunes at 36¢
7. 3 pkg. soap powder at 31¢
8. 5 lb. lettuce at 19¢
9. 4 pkg. raisins at 23¢
10. 10 pencils at 2 for 5¢
11. 15 lemons at 3 for 16¢
12. 4 lb. sauerkraut at 2 for 35¢
13. 12 cans soup at 3 for 27¢
14. 9 bars soap at 3 for 20¢
15. 1 gal. vinegar at 22¢ a qt.
16. 6 cans milk at 2 for 27¢

Exercise 2. (*Written*)

1. Mrs. Ruth Shafer buys from the Economy Market:

2 doz. eggs at 57¢
2 lb. coffee at 79¢
8 lb. meat at 81¢
5 lb. pancake flour, 57¢
2 bags flour at $2.09
24 lb. potatoes at 6¢

List the items as they would appear on a sales ticket. Show the unit price of each item, its extended cost, and the total of the ticket.

2. Mrs. Ethel Miller buys from Riker's Bargain Store:

2 yd. percale @ 47¢
4 yd. dimity @ 89¢
5 yd. gingham @ 84¢
4 yd. ribbon @ 32¢
7 cards buttons @ 15¢
3 yd. lace @ 29¢

Arrange these items as they would be shown on a sales ticket. Find the total.

3. Mrs. Ada Mills makes the following purchases at Fred's Food Market: 5 lb. spare ribs @ 57¢; 2 lb. sauerkraut, 35¢; 12 dill pickles @ 3 for 28¢; 3 boxes saltines @ 26¢; 4 pkg. cereal @ 2 for 37¢; 15 lb. sugar @ 5 for 52¢; 2 doz. oranges @ 45¢; 10 bars soap @ 2 for 15¢. Find the total cost of the purchases.

4. From the Valley Farms Vegetable Stand, Lucile Dunn buys: 2 bunches celery @ 27¢; 3 heads endive @ 19¢; 6 lb. cabbage @ 2 for 19¢; 15 lb. onions @ 13¢; 8 grapefruit @ 4 for 39¢; 15 oranges @ 5 for 27¢; 18 lb. potatoes @ 6¢; 6 lemons @ 4 for 22¢; 5 lb. grapes @ 18¢. Find the total cost of the purchases.

MULTIPLICATION

Need for Multiplication. When you buy two or more articles of one kind for which a unit price is quoted, the amount that you owe for the purchase is found by multiplying the unit price by the number of articles. The sales clerk who determines the amount owed should therefore be able to multiply quickly and accurately. You, also, should be able to multiply quickly and accurately so that you will know you are being charged the correct amount. In solving other practical personal and business problems, you will frequently find it necessary to use the multiplication process.

Placing the Decimal Point in the Product. The decimal point is placed in the product by pointing off from the right as many decimal places as there are decimal places in both the multiplicand and the multiplier.

Example: Find the cost of 4.15 tons of coal at $20.85 a ton.

Solution	*Explanation*	*Proof*
$20.85 *4.15* *10425* *2085* *8340* *$86.5275*	There are two decimal places in the multiplicand and two in the multiplier. Therefore, four places are pointed off from the right in the product. *Ans. $86.53, to the nearest cent*	*4.15* *$20.85* *2075* *3320* *8300* *$86.5275*

Proof of Multiplication. Multiplication may be proved by reviewing the work, step by step, or by the process of reverse multiplication; that is, by interchanging the multiplicand and multiplier, and multiplying again. In the example given above, the proof by reverse multiplication is shown in the calculations at the right of the explanation.

Rounding Numbers. When the final result represents an amount in dollars and cents, as in the example given above, the amount is usually rounded to a whole number of cents.

The method of rounding varies in actual business practice. In some businesses the amount is rounded to the nearest cent. In others, any fraction of a cent, however small, is treated as an additional cent.

In solving the problems in this text, round the final results to the nearest cent except where directions are given to the contrary.

To round a result to the nearest cent, drop the figures to the right of the cents place. If the figure to the right of the cents place is 5 or more, add one to the preceding figure. Thus,

$66.6775 = $66.68, rounded to the nearest cent
$ 2.8749 = $ 2.87, rounded to the nearest cent

The same principle may be applied in cases where a number is to be rounded to the nearest thousand, the nearest hundred, or any other specified place.

Thus, 27,364, rounded to the nearest 10,000, is 30,000; to the nearest 1,000, it is 27,000; to the nearest 100, it is 27,400.

Similarly, 7.9526, rounded to the nearest .1, is 8.0; to the nearest .01, it is 7.95; to the nearest .001, it is 7.953.

Likewise, 4,875, rounded to the first figure on the left, is 5,000; 7.45 rounded to the first figure on the left, is 7; .003825, rounded to the first figure on the left, is .004.

Exercise 3. (*Oral*)

1. Round each of the following as indicated:

a. To the nearest cent: $7.2382; $8.6749; $12.0964; $10.9953
b. To the nearest tenth of a cent: $.0854; $.0467; $.1096
c. To the nearest tenth: 8.835; 4.153; 7.974
d. To the nearest hundredth: 4.536; .5982; .008
e. To the nearest tenth of a cent: 5.37¢; 4.95¢; 9.96¢; 20.98¢.

2. Round each of the following numbers first to the nearest million, then to the nearest hundred thousand, then to the nearest ten thousand, and finally to the nearest thousand.

a. 32,665,049
b. 1,812,276
c. 16,019,844
d. 19,074,825
e. 2,173,560
f. 7,408,681

3. Round each of the following to the first figure on the left.

a. 347
b. 3,806
c. 4,785
d. 2.792
e. 99.9
f. 5.058
g. .0187
h. .0045
i. .0249
j. $13.00
k. $15.45
l. $69.25
m. $234.56
n. $552.67
o. $749.85

Estimating the Product. Either before or immediately after multiplying, you should always make an estimate of the product in order to detect an error in pointing off in the product or a gross error in multiplication. This may be done by rounding the multiplicand and multiplier to simpler numbers that can be multiplied mentally. The product of the rounded numbers is then used as a guide in testing the reasonableness of the exact product.

In the illustrative example on page 19, the multiplicand is $20.85 and the multiplier is 4.15. These may be rounded to $21 and 4, respectively. The approximate product is $21 × 4, or $84. Since the estimated product is $84, the product of the exact factors, $86.5275, is not an unreasonable answer.

On the other hand, if the product of the exact factors had been an amount such as $837.1275 or $8.5485, it would be known at once to be an unreasonable or absurd answer to the problem, as $837.1275 is about ten times the estimated product and $8.5485 is about a tenth of the estimated product. In such cases, however, the estimated product should be calculated again to make sure it is correct before concluding that the exact product is incorrect.

Exercise 4. (*Oral*)

Explain how the estimated answer was found in each of the following:

1. $7.75 × 5.42 is about $40.
2. $17.30 × 12.6 is about $200.
3. $242 × 84 is about $16,000.
4. 38.5 × 6.15 is about 240.
5. 15.7 × 85.62 is about 1,800.
6. 1,282 × 467 is about 500,000.

Exercise 5. (*Written*)

In each of the following problems (1) estimate the product, (2) compute the exact product, (3) check the exact product against the estimate, and (4) prove the exact product by reverse multiplication.

	1.	2.	3.	4.
a.	2.792 × 347	$552.67 × 37	$ 15.45 × 23.7	645.3 × 99.9
b.	3,106 × 342	$685.79 × 56	$ 89.25 × 37.45	346.5 × 28.39
c.	4,385 × 617	$234.56 × 89	$749.85 × 5.068	79.86 × 4.587

Multiplication by 10, 100, and 1,000. To multiply by 10, 100, 1,000, and so on, move the decimal point in the multiplicand to the *right* as many places as there are ciphers in the multiplier, annexing ciphers if necessary. Omit the decimal point in the result if the product turns out to be a whole number. Thus,

645 × 10 = 6,450
.0275 × 100 = 2.75
9.3 × 1,000 = 9,300
$14.16 × 10 = $141.60
$8.50 × 100 = $850
$1,000 × 15.25 = $15,250

Exercise 6. (*Oral*)

Give the product by inspection in each problem:

	1.	2.	3.	4.
a.	318 × 10	$.04 × 1,000	16.2 × $1,000	$.03 × 1,000
b.	$1.37 × 100	42¢ × 10	.038 × 10	100 × $.375
c.	.0365 × 1,000	$54.28 × 10	12¢ × 1,000	$5.60 × 1,000
d.	24¢ × 10	$100 × 3.684	$5.60 × 100	100 × 36¢
e.	22.5 × $100	746.6 × 10	$.45 × 1,000	10 × $62.45

Multiplication of Numbers Containing End Ciphers. When there are end ciphers on the right of the multiplicand or multiplier, or both, and the numbers are whole numbers, multiply only the figures at the left of the end ciphers. Annex to the product as many ciphers as there are end ciphers in both the multiplicand and the multiplier. Study carefully the solutions to the two examples given above. *Notice that the figures which are to be multiplied are arranged vertically in exactly the same manner as they would be if there were no end ciphers.*

```
(a) 305 × 650 = ?          (b) 3,400 × 570 = ?

      3 0 5                      3 4 0 0
        6 5 0                    5 7 0
    1 5 2 5                    2 3 8
  1 8 3 0                    1 7 0
  1 9 8,2 5 0                1,9 3 8,0 0 0
```

End ciphers at the right of a decimal point have no effect upon the value of the number. For example, 3.4, 3.40, and 3.400 all have the same value. Therefore in multiplying such numbers as 3.40, 3.400, and 3.4000, the end ciphers at the right of the decimal point should be ignored, both in the multiplication process and in pointing off in the product.

```
$3.40 × 2,600 = ?

    $ 3.4
      2 6 0 0
    2 0 4
    6 8
  $ 8,8 4 0.0
```

Exercise 7. (*Written*)

In each of the following problems, perform the indicated multiplication in accordance with the directions given above for multiplying numbers containing end ciphers.

	1.	2.	3.	4.
a.	344 × 6,900	580 × 1.206	$8.90 × 67	9,500 × $3.86
b.	4,500 × 368	4.50 × 3,800	460 × $3.24	$98.50 × 140
c.	8,700 × 490	$14.50 × 26	$8,600 × .03216	$24,000 × 1.05

Multiplication by 1¢ and 10¢. To multiply by 1¢, or \$.01, simply move the decimal point in the multiplicand *two places to the left.*

To multiply by 10¢, or \$.10, simply move the decimal point in the multiplicand *one place to the left.* Thus,

135 postage stamps @ \$.01 = \$1.35
53 postage stamps @ \$.10 = \$5.30

Exercise 8. (*Oral*)

State the product of the indicated multiplication in each of the following:

1. 325 lb. @ \$.10
2. 108 lb. @ \$.10
3. 872 ft. @ 1¢
4. 78 gal. @ 10¢
5. 62.5 lb. @ \$.10
6. 37.5 lb. @ \$.10
7. 1,605 lb. @ \$.01
8. 117.5 ft. @ 10¢
9. 2,275 lb. @ 1¢

Problems for Application and Review

Group A

1. (a) Subtract 68,479 from 81,033. (b) Find the product of 3,604 × 13.02.

2. According to his August bank statement, Ray Daggett's bank balance on August 31 was \$361.70. His checkbook balance on that date was \$340.01. Upon comparing the checkbook record with the returned checks and the bank statement, he discovered that one of the canceled checks, No. 112, was issued for \$26.50, while the amount recorded on the check stub was \$2.65. A bank service charge of \$.57 appeared on the bank statement but not in the checkbook record. The following checks were found to be outstanding: No. 109 for \$14.82; No. 116 for \$21.41; No. 117 for \$9.88. Reconcile the balances.

3. The owner of the Rosalie Hat Shop bought 15 dozen hats at \$27 a dozen and paid \$13.65 express charges on the shipment. He sold the hats at \$2.49 each. (a) What was the gross cost of the 15 dozen hats? (b) What was his gross profit on the entire lot?

The *gross cost* is the purchase price of the hats plus the cost of the express charges. The *gross profit* is the total amount received for the hats minus the gross cost.

4. A grocer had 150 bushels of potatoes in stock that cost him \$435. He sold 120 bushels at \$3.60 a bushel and the remainder at \$3.30 a bushel. What was his gross profit on the 150 bushels?

5. A ticket seller at a football game was given 225 fifty-five cent tickets and $20 in change. At the end of the game, he turned in 27 tickets and $125.90 in money. (a) Is this the correct amount of money he should have returned? (b) If not, how much was it more or less than the correct amount?

6. The Maywood Men's Shop advertises men's shirts at $2.45 each or 3 shirts for $6.50. How much would a customer save by buying 3 shirts at one time rather than 3 shirts one at a time?

Group B

1. (a) From 10,131, subtract 8,286. (b) Find the product of 40,700 × 3,020.

2. A fruit dealer purchased 8 crates of oranges, each crate containing 176 oranges, at $4.85 a crate, and paid $3.44 for freight and cartage on the shipment. He sold the oranges at 48¢ a dozen. What was his gross profit on the entire lot?

3. The Hilton Dress Store purchased 300 dresses at $16 each. The store sold 80 of the dresses at $29.95, 100 at $24.95, and the remainder at $19.95. What was the store's gross profit on the entire lot?

4. A ticket seller for a school entertainment was given 150 thirty-five cent tickets, 300 twenty-five cent tickets, and $15 in change. He returned 38 thirty-five cent tickets, 27 twenty-five cent tickets, and $122.50 in money. (a) Is this the amount of money he should have returned? (b) If not, how much did he lack or how much did he have in excess?

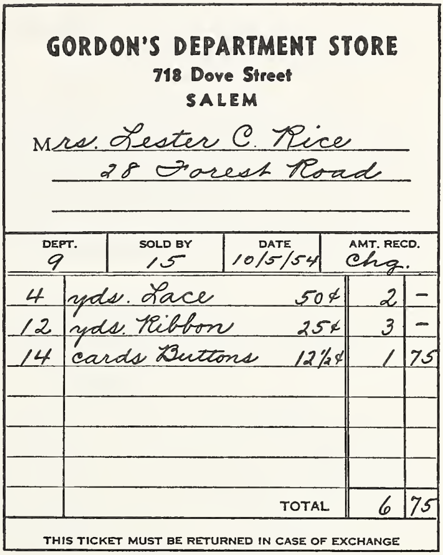
5. In the Stevens Clothing Store, neckties are priced at 49¢ each or 3 for $1.35. How much would a customer save by buying 3 ties at one time rather than 3 ties one at a time?

6. G. A. Caruso, retail fruit dealer, purchased a crate of pears (135 pears to the crate) for $7.75. He sold the pears at the rate of 3 for 23 cents. At that rate, what was the amount of his gross profit on the entire lot?

7. A grocer bought 3 crates of eggs (30 dozen to the crate) at $13.20 a crate. Upon opening the crates he found 2 dozen eggs broken and threw them away. He sold the remainder at 58¢ a dozen. What was his gross profit on the entire transaction?

Section 2 . . . Sales Tickets Involving Aliquot Parts

Aliquot Parts. You will notice in the sales ticket below that the prices of the articles are exact fractional parts of $1.00. Thus, 50¢ equals ½ of $1.00; 25¢ equals ¼ of $1.00; and 12½¢ equals ⅛ of $1.00.



GORDON'S DEPARTMENT STORE
718 Dove Street
SALEM

Mrs. Lester C. Rice
28 Forest Road

DEPT.	SOLD BY	DATE	AMT. RECD.
9	15	10/5/54	Chg.

4	yds. Lace	50¢	2	–
12	yds. Ribbon	25¢	3	–
14	cards Buttons	12½¢	1	75
	TOTAL		6	75

THIS TICKET MUST BE RETURNED IN CASE OF EXCHANGE

Sales Ticket

Each of these prices is contained in $1.00 without a remainder. When a number is contained in another number without a remainder, the first number is known as an aliquot part of the second number.

For example 5¢ is contained in 10¢ exactly two times. Therefore, 5¢ is an aliquot part of 10¢.

Similarly, 2½¢ is an aliquot part of 10¢, because 2½¢ is contained four times in 10¢ without a remainder. Likewise, $.25 is an aliquot part of $1; $2.50 is an aliquot part of $10; $25 is an aliquot part of $100; and $250 is an aliquot part of $1,000.

Each aliquot part is a fractional part of the number on which it is based. For example, as stated above, 5¢ is contained in 10¢ exactly two times. It is therefore exactly ½ of 10¢; that is, 5¢ = ½ of 10¢. In this case, 10¢ is said to be the *base*; and ½ is said to be the *fractional equivalent* of 5¢ in relation to the base, 10¢. The fractional equivalent, ½, expresses the part that 5¢ is of 10¢.

Similarly, 2½¢ is ¼ of 10¢; $.25 is ¼ of $1; $2.50 is ¼ of $10; $25 is ¼ of $100; and $250 is ¼ of $1,000. Note that the fractional equivalent is the same in each of these cases, but that the amount representing the base is different.

Multiples of Aliquot Parts. In this text the term "aliquot part" is used also to describe a number that is a convenient multiple of an aliquot part.

For example, $7\frac{1}{2}$¢ is 3 times $2\frac{1}{2}$¢. Since $2\frac{1}{2}$¢ is $\frac{1}{4}$ of 10¢, it follows that $7\frac{1}{2}$¢ is $\frac{3}{4}$ of 10¢.

Similarly, \$.75 is $\frac{3}{4}$ of \$1; \$7.50 is $\frac{3}{4}$ of \$10; \$75 is $\frac{3}{4}$ of \$100; and \$750 is $\frac{3}{4}$ of \$1,000.

Multiplication by an Aliquot Part. The unit price of an article is sometimes an aliquot part of 10¢, \$1.00, or \$10.00. When several articles of one kind are purchased, and the unit price is an aliquot part, the work of multiplying to find the total cost can be shortened by multiplying the quantity by the base and the fractional equivalent of the unit price, rather than multiplying by the unit price itself.

Example: Find the cost of 84 yards of ribbon at $7\frac{1}{2}$¢ a yard.

Solution

METHOD 1	METHOD 2
84 × $7\frac{1}{2}$¢ = ?	*84 × $7\frac{1}{2}$ = ?*
Since $7\frac{1}{2}$¢ = $\frac{3}{4}$ of 10¢,	*Since $7\frac{1}{2}$¢ = $\frac{3}{4}$ of 10¢,*
the problem becomes	*the problem becomes*
84 × $\frac{3}{4}$ × 10¢ = ?	*84 × $\frac{3}{4}$ × 10¢ = ?*
84 × $\frac{3}{4}$ = 63	*84 × 10¢ = \$8.40*
63 × 10¢ = \$6.30 Ans.	*\$8.40 × $\frac{3}{4}$ = \$6.30 Ans.*

RULE. *To multiply a number by an aliquot part, multiply separately by the fractional equivalent and the base.*

As indicated by the solutions of the foregoing example, there are two methods of applying the rule:

Method 1. Multiply first by the fractional equivalent ($\frac{3}{4}$) and then by the base (10¢).

Method 2. Multiply first by the base (10¢) and then by the fractional equivalent ($\frac{3}{4}$).

The final product is the same by either method. However, when the multiplication is to be performed mentally, without the aid of written calculations, the numbers can often be held in mind more easily by Method 1.

Table of Aliquot Parts of $.10, $1, $10, $100, and $1,000. The following tables show the important aliquot parts of $.10, $1, $10, $100, and $1,000.

Base	Fractional Equivalent						
	½	¼	¾	⅛	⅜	⅝	⅞
$ .10	$ .05	$ .02½	$ .07½	$ .01¼	$ .03¾	$ .06¼	$ .08¾
$ 1	.50	.25	.75	.12½	.37½	.62½	.87½
$ 10	5.00	2.50	7.50	1.25	3.75	6.25	8.75
$ 100	50.00	25.00	75.00	12.50	37.50	62.50	87.50
$1,000	500.00	250.00	750.00	125.00	375.00	625.00	875.00

Base	Fractional Equivalent						
	⅓	⅔	⅙	⅚	1/12	1/15	1/16
$.10	$ .03⅓	$ .06⅔	$ .01⅔	$ .08⅓			
$ 1	.33⅓	.66⅔	.16⅔	.83⅓	$ .08⅓	$ .06⅔	$ .06¼

Exercise 9. (Oral)

¼, ½, and ¾. In each of the following problems, recite the solution and give the product of the indicated multiplication. For example, the recited solution of Problem 1-a would be one of the following:

2½¢ equals ¼ of 10¢.	2½¢ equals ¼ of 10¢.
48 times ¼ equals 12.	48 times 10¢ equals $4.80.
12 times 10¢ equals $1.20.	$4.80 times ¼ equals $1.20.

	1.	2.	3.	4.
a.	48 @ 2½¢	182 @ 5¢	28 @ 7½¢	32 @ $250
b.	36 @ $.25	124 @ $.50	32 @ $.75	28 @ $75
c.	24 @ $2.50	68 @ $5	12 @ $7.50	124 @ 2½¢
d.	16 @ $25	46 @ $50	24 @ $75	16 @ $750
e.	12 @ $250	26 @ $500	16 @ $750	64 @ $2.50
f.	32 @ $25	84 @ $.02½	36 @ 75¢	84 @ $7.50
g.	28 @ 25¢	44 @ $2.50	48 @ $.07½	88 @ 7½¢

Exercise 10. (*Oral*)

$\frac{1}{8}$ *and* $\frac{3}{8}$. For each of the following problems, recite the solution and give the product of the indicated multiplication.

	1.	2.	3.	4.
a.	72 @ $1\frac{1}{4}$¢	64 @ $3\frac{3}{4}$¢	96 @ \$1.25	32 @ \$12.50
b.	64 @ $\$.12\frac{1}{2}$	88 @ $\$.37\frac{1}{2}$	72 @ $\$.03\frac{3}{4}$	248 @ $\$.01\frac{1}{4}$
c.	56 @ \$1.25	48 @ \$3.75	56 @ \$37.50	64 @ \$3.75
d.	24 @ \$12.50	32 @ \$37.50	168 @ $12\frac{1}{2}$¢	48 @ \$1.25
e.	16 @ \$125	24 @ \$375	96 @ $37\frac{1}{2}$¢	240 @ $3\frac{3}{4}$¢

Exercise 11. (*Oral*)

$\frac{5}{8}$ *and* $\frac{7}{8}$. For each of the following problems, recite the solution and give the product of the indicated multiplication.

	1.	2.	3.	4.
a.	24 @ $6\frac{1}{4}$¢	88 @ $8\frac{3}{4}$¢	72 @ \$6.25	16 @ \$62.50
b.	72 @ $\$.62\frac{1}{2}$	64 @ $\$.87\frac{1}{2}$	72 @ $\$.08\frac{3}{4}$	120 @ $\$.06\frac{1}{4}$
c.	56 @ \$6.25	32 @ \$8.75	48 @ \$62.50	24 @ \$8.75
d.	32 @ \$62.50	48 @ \$87.50	88 @ $62\frac{1}{2}$¢	120 @ \$6.25
e.	24 @ \$625	16 @ \$875	56 @ $87\frac{1}{2}$¢	320 @ $8\frac{3}{4}$¢

Exercise 12. (*Oral*)

$\frac{1}{3}$ *and* $\frac{2}{3}$. For each of the following problems, recite the solution and give the product of the indicated multiplication.

	1.	2.	3.	4.
a.	36 @ $3\frac{1}{3}$¢	36 @ $6\frac{2}{3}$¢	45 @ $\$.33\frac{1}{3}$	75 @ $66\frac{2}{3}$¢
b.	27 @ $\$.33\frac{1}{3}$	24 @ $\$.66\frac{2}{3}$	63 @ $6\frac{2}{3}$¢	390 @ $\$.03\frac{1}{3}$
c.	39 @ $33\frac{1}{3}$¢	33 @ $66\frac{2}{3}$¢	246 @ $3\frac{1}{3}$¢	276 @ $33\frac{1}{3}$¢
d.	63 @ $\$.03\frac{1}{3}$	39 @ $\$.06\frac{2}{3}$	66 @ $\$.66\frac{2}{3}$	123 @ $\$.06\frac{2}{3}$

Exercise 13. (*Oral*)

$\frac{1}{6}$ *and* $\frac{5}{6}$. For each of the following problems, recite the solution and give the product of the indicated multiplication.

	1.	2.	3.	4.
a.	72 @ $1\frac{2}{3}$¢	42 @ $8\frac{1}{3}$¢	48 @ $\$.16\frac{2}{3}$	66 @ $83\frac{1}{3}$¢
b.	12 @ $\$.16\frac{2}{3}$	24 @ $\$.83\frac{1}{3}$	54 @ $8\frac{1}{3}$¢	246 @ $\$.01\frac{2}{3}$
c.	54 @ $16\frac{2}{3}$¢	18 @ $\$.08\frac{1}{3}$	18 @ $1\frac{2}{3}$¢	120 @ $16\frac{2}{3}$¢
d.	66 @ $\$.01\frac{2}{3}$	36 @ $83\frac{1}{3}$¢	48 @ $\$.83\frac{1}{3}$	420 @ $\$.08\frac{1}{3}$

Exercise 14. (*Oral*)

$\frac{1}{12}$, $\frac{1}{15}$, and $\frac{1}{16}$. The table of aliquot parts on page 27 shows that $8\frac{1}{3}$¢, $6\frac{2}{3}$¢, and $6\frac{1}{4}$¢ are aliquot parts of both 10¢ and $1. Either of the two bases may be used in multiplying by $8\frac{1}{3}$¢, $6\frac{2}{3}$¢, and $6\frac{1}{4}$¢. Ordinarily, however, if the other factor in the multiplication problem is a number that is exactly divisible by 12, 15, or 16, the aliquot part of $1 is used, since $8\frac{1}{3}$¢, $6\frac{2}{3}$¢, and $6\frac{1}{4}$¢ are, respectively, $\frac{1}{12}$, $\frac{1}{15}$, and $\frac{1}{16}$ of $1.

For each of the following problems, recite the solution and give the product of the indicated multiplication, using aliquot parts based on $1.

	1.	2.	3.	4.
a.	48 @ $8\frac{1}{3}$¢	64 @ $6\frac{1}{4}$¢	108 @ $8\frac{1}{3}$¢	84 @ $8\frac{1}{3}$¢
b.	75 @ $6\frac{2}{3}$¢	36 @ $8\frac{1}{3}$¢	96 @ $6\frac{1}{4}$¢	32 @ $.06$\frac{1}{4}$
c.	32 @ $6\frac{1}{4}$¢	105 @ $6\frac{2}{3}$¢	450 @ $.06$\frac{2}{3}$	225 @ $.06$\frac{2}{3}$
d.	45 @ $.06$\frac{2}{3}$	48 @ $.06$\frac{1}{4}$	320 @ $6\frac{1}{4}$¢	1,080 @ $8\frac{1}{3}$¢
e.	72 @ $.08$\frac{1}{3}$	24 @ $.08$\frac{1}{3}$	480 @ $.08$\frac{1}{3}$	640 @ $6\frac{1}{4}$¢

Exercise 15. (*Written*)

For each of the following aliquot parts, write from memory the fractional equivalent and the base. For example, in item 1-a, the answer would be: "$\frac{1}{4}$ of $10."

	1.	2.	3.	4.	5.	6.	7.	8.
a.	$2.50	$75	$1.25	$37\frac{1}{2}$¢	$12.50	$12\frac{1}{2}$¢	$8\frac{3}{4}$¢	$.16$\frac{2}{3}$
b.	$5	$2\frac{1}{2}$¢	$.01$\frac{1}{4}$	75¢	$3.75	$87.50	$33\frac{1}{3}$¢	$.08$\frac{1}{3}$
c.	$7.50	$.07$\frac{1}{2}$	25¢	$1.25	$.06$\frac{1}{4}$	$62\frac{1}{2}$¢	$7\frac{1}{2}$¢	$.06$\frac{2}{3}$
d.	$25	$50	$1.25	$3\frac{3}{4}$¢	$375	$3.75	$.62$\frac{1}{2}$	$.33$\frac{1}{3}$
e.	$500	$250	$7.50	$37.50	$625	$.87$\frac{1}{2}$	$6\frac{2}{3}$¢	$1\frac{2}{3}$¢
f.	$.75	50¢	$12.50	$12\frac{1}{2}$¢	$75	$62.50	$66\frac{2}{3}$¢	$.03$\frac{1}{3}$
g.	$.05	$.12$\frac{1}{2}$	$37.50	$6.25	$1\frac{1}{4}$¢	$875	25¢	$.83$\frac{1}{3}$
h.	$.25	$2.50	$1.25	$125	$62.50	$75	$87\frac{1}{2}$¢	$.66$\frac{2}{3}$
i.	$7.50	$750	$3.75	$62\frac{1}{2}$¢	$8.75	$.37$\frac{1}{2}$	$3\frac{1}{3}$¢	$16\frac{2}{3}$¢

Problems for Application and Review

Group A

1. (a) Subtract 2,694 from 8,103. (b) Find the product of 7,900 × 260. (c) Find the cost of 8,500 bu. at $87\frac{1}{2}$¢ a bu.

2. The owner of a men's clothing store purchased 78 dozen shirts at $25 a dozen. He sold 425 shirts at $2.89, 357 at $2.45, and the remainder at $1.98. What was his gross profit on the entire lot?

3. Thomas Wood, owner of a variety store, buys pencils at $2.70 a gross (12 dozen) and sells them at the rate of 2 pencils for 5 cents. Find his gross profit on one gross.

4. On March 31, Robert Becker's checkbook balance was $584.52. Upon comparing his check stubs with the items on the March bank statement, Mr. Becker discovered the following discrepancies: The bank had deducted $.32 for a service charge. The bank statement showed a deposit of $35.95 that had not been recorded in the checkbook. The bank had paid a check for $18.75 that was not recorded on the check stubs. A check for $65, which he had deposited and added to his checkbook balance, had been returned by the bank bearing the notation "No funds" and charged to his account. No record of this charge had been made in his checkbook. Find the amount of the correct checkbook balance.

5. A ticket seller for a high school basketball game was given 250 thirty-five cent tickets and $10 in change. At the end of the game he turned in 37 tickets and $84.35 in money. (a) Is this the amount of money he should have returned? (b) If not, how much did he lack or how much did he have in excess?

Group B

1. (a) From 639,004, subtract 545,675. (b) Find the product of 400.97 × 1,080. (c) Find the cost of 1,665 gallons at $16\frac{2}{3}$¢.

2. Last year, the sales of H. J. Myron were $31,482.60. His inventory at the beginning of the year was $10,344.50. His purchases during the year amounted to $21,246.50. His inventory at the end of the year was $9,868.25. Find (a) the cost of goods sold and (b) the gross profit for the year.

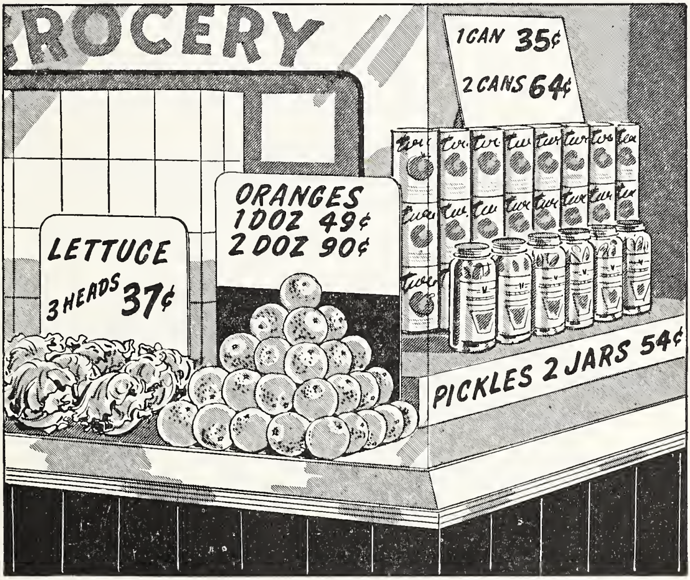
3. A grocer bought 25 cases of canned peas (24 cans to the case) at $2.65 a case. He sold them at the rate of 2 cans for 29 cents. At that rate, what was his gross profit on the 25 cases?

4. A clothier purchased 150 dozen straw hats at $22.50 a dozen. He sold 1,410 of the hats at $3.45 and the remainder at $1.95. What was his gross profit on the 150 dozen?

5. A retailer bought 3 crates of strawberries (24 quarts to the crate) at $7.92 a crate. What was his gross profit on the entire transaction if he threw out 3 quarts that were spoiled and sold the remainder at 45¢ a quart?

Section 3 . . Determining Unit Prices

Price Quotations in Retail Stores. A store often quotes two prices on the same article: one for a single unit and one for a certain number of units. The price for a group of units generally indicates a lower price for each unit in the group than the price for a single unit. Prices are set in this way in order to encourage the customer to buy in larger quantities. Thus, in the illustration shown above, you will notice that the price of two dozen oranges, 90¢, averages only 45¢ a dozen, although the price of one dozen, when bought separately, is 49¢. Similarly, two cans of peaches are offered at 64¢, or 32¢ a can; but if a single can is bought, the price is 35¢. When a price is quoted for several units, you can very often save one, two, or more cents a unit by purchasing the larger quantity.



Price Quotations of a Grocery Store

Determining Unit Prices. A store frequently quotes the price of a group of two or more units of the same article, but does not quote the price of one unit. Thus, in the illustration on page 31, the price of three heads of lettuce is 37¢.

When the quoted price is for a group of units and the price of a single unit is not stated, the unit price is the group price divided by the number of units in the group. Any fraction of a cent in the unit price is considered as an additional cent. For example, if the price of three heads of lettuce is 37¢, the price of a single head of lettuce is 13¢ since 37¢ ÷ 3 is $12\frac{1}{3}$¢.

Exercise 16. (*Oral*)

1. You are looking over the advertising section of your daily paper and find the following special quotations on various items. Read rapidly the cost of a single unit of each item.

3 cans of beans	$ .55	6 bars of soap	$ .45
5 lbs. of candy	2.60	4 Turkish washcloths	1.15
10 cans of milk	1.34	12 cans of soup	1.80

2. Jones Grocery Store, in advertising the commodities below, gives both the price of a single unit and the price of a certain number of units. Determine for each commodity the saving on a unit when the larger quantity is purchased.

Sugar	1 lb.	11¢	10 lb.	$1.05
Crackers	1 box	16¢	6 boxes	90¢
Pickles	1 jar	25¢	2 jars	46¢
Potatoes	1 peck	90¢	4 pecks	$3.45
Carrots	1 bunch	9¢	3 bunches	25¢
Preserves	1 jar	49¢	2 jars	90¢

DIVISION

Need for Division. In computing the price of one unit when the price is given in terms of several units, you must divide by the number of units. It is therefore essential that you be able to divide rapidly. As you read price quotations on store cards and store windows, you should be able by mental division to convert them immediately into prices per unit. In solving other personal and home problems, you will often find it necessary to use the process of division.

Expressing the Remainder as a Fraction. In many division problems, the division is not exact; hence, there is an undivided remainder.

$$1{,}047 \div 24 = ?$$

$$\begin{array}{r}
43\frac{5}{8}\phantom{= \frac{15}{24} = \frac{5}{8}} \\
24\overline{)1047}\phantom{= \frac{15}{24} = \frac{5}{8}} \\
\underline{96}\phantom{= \frac{15}{24} = \frac{5}{8}} \\
87\phantom{= \frac{15}{24} = \frac{5}{8}} \\
\underline{72}\phantom{= \frac{15}{24} = \frac{5}{8}} \\
15 = \frac{15}{24} = \frac{5}{8}
\end{array}$$

Ans. $43\frac{5}{8}$

For example, in the illustration at the right, it is seen that 24 is contained 43 times in 1,047, with a remainder of 15.

Such a remainder may be expressed in the quotient as a fractional part of the divisor by writing the remainder over the divisor. The fraction in the quotient should always be expressed in lowest terms.

Thus, in the example at the right, the remainder expressed as a fractional part of the divisor is $\frac{15}{24}$. This fraction is reduced to its lowest terms by dividing the numerator and denominator by 3, giving the fraction $\frac{5}{8}$.

The complete quotient is therefore $43\frac{5}{8}$.

Proof of Division. The quotient in a division problem may be proved by multiplying the whole number in the quotient by the divisor, and then adding the remainder to the product of that multiplication. The result should equal the dividend.

$$\begin{array}{r}
43 \times 24 = 1{,}032 \\
\underline{+15} \\
1{,}047
\end{array}$$

The illustration at the left shows the proof of the division in the example given above. 43 is the whole number in the quotient; and 24 is the divisor. The product of 43 and 24 is 1,032. The remainder, 15, is added to 1,032, giving 1,047, which is the same as the number in the dividend.

Exercise 17. (Written)

In each of the following, divide and then prove the division. Express the remainder, if any, as a fractional part of the divisor.

1. 3,978 ÷ 17
2. 8,125 ÷ 23
3. 5,460 ÷ 16
4. 3,384 ÷ 62
5. 7,668 ÷ 42
6. 4,368 ÷ 28
7. 4,268 ÷ 49
8. 1,776 ÷ 98

Locating the Decimal Point in the Quotient When the Divisor Is a Whole Number. When the dividend contains a decimal and the divisor is a whole number, the decimal point in the quotient is placed directly over the decimal point in the dividend.

$$\begin{array}{r} 8.25 \\ 23\overline{)189.75} \end{array}$$

The illustration at the left indicates the division of 189.75 by 23. The decimal point in the quotient, 8.25, is placed directly over the decimal point in the dividend, 189.75.

Law of Division. In any problem in division, the dividend and divisor may be multiplied or divided by the same number without changing the value of the quotient.

For example, 15 ÷ 3 = 5. If the dividend and divisor are multiplied by 10 before dividing, the problem becomes 150 ÷ 30. The quotient of 150 ÷ 30 is 5, which is the same as the quotient of 15 ÷ 3.

Similarly, 2,400 ÷ 600 = 4. If the dividend and divisor are divided by 100 before dividing, the problem becomes 24 ÷ 6. The quotient of 24 ÷ 6 is 4, the same as the quotient of 2,400 ÷ 600.

Locating the Decimal Point in the Quotient When the Divisor Contains a Decimal. When the divisor contains a decimal, move the decimal point to the *right* in both the dividend and divisor as many places as are required to make the divisor a whole number. Then divide in the usual manner.

Example: Divide 21.7 by 1.75.

Solution

$$\begin{array}{r} 12.4 \\ 1\underset{\curvearrowright}{.75.}\overline{)21\underset{\curvearrowright}{.70.}0} \end{array}$$

Ans. 12.4

Explanation

The decimal points in both the dividend and divisor are moved to the right two places, thereby changing the divisor to a whole number.

Moving the decimal points to the right two places results in multiplying both numbers by 100. This does not change the value of the quotient.

The decimal point in the quotient is placed directly above the new position of the decimal point in the dividend.

Exercise 18. (Written)

The following problems provide practice in locating the decimal point in the quotient. Perform the indicated division in each problem and prove the result.

1. 288 ÷ .072
2. 2,880 ÷ 7.2
3. 2,880 ÷ .72
4. .288 ÷ .00072
5. .576 ÷ .00144
6. .00144 ÷ .576
7. 5.76 ÷ .144
8. .001 ÷ 25
9. .0025 ÷ 125
10. 12,500 ÷ 62.5
11. 62.5 ÷ 125
12. .0625 ÷ .125

Finding the Unknown Factor of a Product. Division is usually defined as the process of finding how many times one number is contained in another number. Division may also be defined as the process of finding one of two factors when their product and one of the factors are known.

For example, in the expression $8 \times 7 = 56$, 8 and 7 are the factors and 56 is the product. Since $8 \times 7 = 56$, it follows that $56 \div 7 = 8$. Therefore, if we wish to find what number multiplied by 7 will give 56, we may divide 56, the product, by 7, the known factor, to find the unknown number or factor.

Hence, *to find the unknown factor of a product, divide the product by the known factor.*

Exercise 19. (*Oral*)

1. 8 multiplied by what number gives 104?
2. What number multiplied by 9 gives 135?
3. 7 times 14 gives what number?
4. What number divided by 8 gives 16?
5. 105 is 7 times what number?
6. 126 divided by what number gives 9?
7. What number is 3 more than 7 times 9?
8. 5 more than 6 times 8 is what number?
9. 125 is 5 more than 8 times what number?
10. 15 less than 165 is 5 times what number?
11. What number is 4 less than 5 times 7?
12. 3 less than 9 times 7 is what number?
13. 9 times 7 is 3 less than what number?
14. 92 is 4 less than 8 times what number?
15. 6 more than 66 is 6 times what number?

Problems for Application and Review

Group A

1. (a) Divide 26.6004 by 82.1. (b) .35 multiplied by what number gives 28? (c) Find the cost of 180 articles at $37\frac{1}{2}$¢ each.

2. A millinery dealer bought 20 dozen ladies' hats for $540. He sold 106 hats at $4.50 each, 50 at $3.84, and the remainder at $1.15. (a) Find the total amount of his gross profit. (b) Find the average amount of profit on each hat.

3. A clothier bought 650 men's summer suits for $12,675 and marked them to sell at $29.50 each. During the regular season, 572 suits were sold at this price. At the end of the season, 78 suits remained unsold and were closed out at $23.95 each. What was the store's gross profit on the 650 suits?

4. The Carl Candy Store bought 1,200 boxes of candy at 65¢ a box. The store sold 1,095 boxes at 95¢ a box. The remainder became unsalable because of spoilage and were thrown away. What was the store's gross profit on the entire transaction?

5. On June 30, George Stedman's checkbook balance was $141.17. A comparison of the checkbook with the June bank statement revealed the following facts: A check for $12.35 that had been deposited was returned marked "Insufficient funds" and charged against his account, but this fact had not been recorded in the checkbook. A check for $124.65 had been recorded on the check stub as $142.65. The bank had paid a check for $32.90 that was not recorded on the check stub. A deposit of $20 had been entered in the checkbook a second time by mistake. The bank had deducted $.88 for a service charge. Find the correct checkbook balance. 93.04

Group B

1. (a) Divide 10.61874 by 2.79. (b) .085 times what number gives 357? (c) Find the cost of 2,564 pounds at $12\frac{1}{2}$¢ a pound. (d) What number divided by 14 gives 28?

2. According to the monthly statement that R. C. Moore received from his bank, his bank balance was $2,176.15. His checkbook balance on that date was $1,838.14. He found the following checks outstanding: $215.20; $186.06; $62.25. A check for $125.50 that he had deposited had been returned marked "Insufficient funds" and had been charged to his account, but no record of this charge had been made in the checkbook. Prepare a reconciliation statement.

3. A high school entertainment was given on two successive evenings. For each performance there were issued 250 reserved seat tickets at 35¢ each and 850 regular tickets at 25¢ each. Expenses amounted to $167. All reserved seat tickets were sold, but 42 regular tickets for the first performance and 53 regular tickets for the second performance were unsold. Find the total net profit for the two entertainments.

4. A box containing 50 packages of envelopes made to retail at 2 packages for 15 cents is purchased by a retail stationer for $2.50. What is his gross profit on one box of envelopes?

Section 4 . . . Articles Priced by the Hundred, Hundredweight, Thousand, and Ton

Special Units for Quoting Prices. The prices of many kinds of articles are quoted by the *hundred* (C), the *hundredweight* or *hundred pounds* (cwt.), the *thousand* (M), and the *ton* (T).

For example, the prices of business envelopes and paper are sometimes quoted by the hundred. Livestock feed and certain kinds of steel and wire products are quoted by the hundredweight. Brick, tile, shingles, and lumber are quoted by the thousand. Coal, hay, and fertilizer are usually quoted by the ton.

Finding the Cost of Goods Priced by the C, Cwt., or M. To find the cost of a quantity of goods priced by the hundred, hundredweight, or thousand, first determine the number of hundreds or thousands by dividing the quantity figure by 100 or 1,000, as the case may be. Then multiply that result by the unit price.

Example: Find the cost of 1,100 bricks at $35 per M.

Solution: *1,100 ÷ 1,000 = 1.1*
$35 × 1.1 = $38.50 Ans.

Finding the Cost of Goods Priced by the Ton. To find the cost of a quantity expressed in pounds, which is priced by the ton, reduce the quantity figure to tons by dividing it by 2,000, the number of pounds in one ton. Then multiply that result by the price per ton.

Example: Find the cost of 2,400 lb. of coal at $21.50 per ton.

Solution: *2,400 ÷ 2,000 = 1.2 tons*
$21.50 × 1.2 = $25.80 Ans.

In some cases where the price per ton is an even number, the solution can be shortened by dividing the quantity in pounds by 1,000 and then multiplying that result by half the price per ton.

Example: Find the cost of 3,150 lb. of hay at $32 per ton.

Solution

3,150 ÷ 1,000 = 3.15
$32 ÷ 2 = $16
$16 × 3.15 = $50.40 Ans.

Explanation

Dividing 3,150 by 1,000 gives 3.15, the number of thousands of pounds in 3,150. Since the price per ton is $32, half of this price, or $16, is the price of 1,000 pounds. The cost is therefore $16 × 3.15, or $50.40.

Exercise 20. (*Written*)

1. Find the cost of 345 machine bolts at $4.15 per hundred.

2. What is the cost of 764 pounds of wire at $7.16 per hundredweight?

3. At $31.75 per thousand, what is the cost of 4,750 bricks?

4. At $22.35 a ton, what is the value of a load of coal weighing 5,560 pounds?

5. Find the cost of 2,775 pounds of fertilizer at $46.50 a ton.

6. Find the cost of the purchase in each of the following:

a. 275 articles at $1.80 per C.
b. 2,350 lb. @ $5.35 per cwt.
c. 72 articles @ $3.30 per C.
d. 83 lb. @ $10.50 per cwt.
e. 455 articles @ $8.10 per M.
f. 762 ft. @ $49.80 per M.
g. 4,620 articles at $14.40 per M.
h. 11,700 lb. @ $8.95 per ton.
i. 2,840 lb. @ $12.25 per T.
j. 1,460 lb. @ $9.15 per T.
k. 1,640 lb. @ $18 per ton.
l. 2,325 lb. @ $8.80 per T.
m. 1,810 lb. @ $6.50 per ton
n. 3,640 lb. @ $7.60 per T.

DIVISION (*Continued*)

Division by 10, 100, and 1,000. To divide by 10, 100, 1,000, and so on, move the decimal point to the left in the dividend as many places as there are ciphers in the divisor, prefixing ciphers if necessary. Thus,

4,300 ÷ 10 = 430
286 ÷ 100 = 2.86
8,400 ÷ 1,000 = 8.4

73.4 ÷ 10 = 7.34
.56 ÷ 100 = .0056
62.8 ÷ 1,000 = .0628

Exercise 21. (*Mental*)

In each of the following, perform the division mentally by the method explained above. Write the quotient only.

	1.	2.	3.	4.
a.	1,500 ÷ 10	93 ÷ 10	6.2 ÷ 1,000	20 ÷ 1,000
b.	32,000 ÷ 100	4,986.2 ÷ 1,000	50 ÷ 100	.008 ÷ 10
c.	78,000 ÷ 1,000	2.4 ÷ 10	400 ÷ 1,000	.7 ÷ 1,000
d.	870 ÷ 100	.35 ÷ 100	8 ÷ 100	6.01 ÷ 100

Exercise 22. (*Mental*)

Find the cost in each of the following. In each case, perform the necessary multiplication and division mentally, without the aid of written calculations, writing the final result only.

	1.	2.
a.	300 articles @ $12 per C.	900 articles @ $8 per M.
b.	1,600 lb. @ $3 per cwt.	700 articles @ $10 per M.
c.	80 articles @ $10 per C.	450 articles @ $6 per M.
d.	40 articles @ $1 per C.	4,000 lb. @ $15 per T.
e.	135 articles @ $10 per C.	6,000 lb. @ $13 per T.
f.	140 lb. @ $.70 per cwt.	12,000 lb. @ $8 per T.
g.	25 articles @ $100 per C.	1,500 lb. @ $12 per T.
h.	2,000 articles @ $6 per M.	700 lb. @ $10 per T.
i.	2,300 lb. @ $10 per M.	600 lb. @ $14 per T.
j.	2,750 ft. @ $100 per M.	1,550 lb. @ $20 per T.

Problems for Application and Review

Group A

1. (a) Find the cost of 265 lb. of feed at $3.20 per cwt. (b) Divide 10.325 by 41.3. (c) .45 times what number gives 54? (d) Find the product of 104,000 × 1,850. (e) What number divided by 8.5 gives 2.04?

2. A retail fruit dealer bought a crate of strawberries (32 quarts) for $5.85. He had to throw out 3 quarts that were spoiled and unsalable. He sold the remainder at 35¢ a quart. What was his gross profit on the entire transaction?

3. A dress shop purchased 300 dresses for $3,900. They sold 150 of them at $22.50, 100 at $19.50, and the remainder at $15.00. (a) What was the store's gross profit on the entire lot? (b) What was the store's average gross profit per dress?

4. A retail furniture dealer buys a studio couch for $85. At what price should he sell it if he desires a gross profit of $65?

5. A grocer buys a crate of strawberries (24 quarts) for $8.10 delivered. At what price per quart should he sell the berries so that his gross profit on the entire lot will be $2.70?

6. Joseph Hanley, owner of Joe's Cigar Store, bought 30 boxes of cigars at $4.50 a box, each box containing 50 cigars. He sold them at the rate of 2 cigars for 25 cents. What was his gross profit on the 30 boxes?

Group B

1. (a) Find the cost of 13,250 bricks at $29.60 per M. (b) What number divided by 1.45 gives 46.4? (c) Find the product of 8,100 × 620. (d) Divide .8606 by 6.5. (e) .65 × what number equals 52?

2. A men's clothing store bought 500 summer suits at $22.75 each and marked them to sell at $35. During the regular season, 420 suits were sold at this price. At the end of the season, the remaining suits were closed out at $28 each. (a) What was the store's gross profit on the entire lot? (b) What was the average profit per suit?

3. A grocer buys canned beans at $1.60 a dozen cans. If he sells them at the rate of 3 cans for 55¢, what is his gross profit per can?

4. A wholesale produce dealer purchased 150 bushels of apples for $485. What average price per bushel did he receive for the apples if his gross profit on the entire lot was $77.50?

5. A grocer bought a case of eggs (30 dozen) for $15.60. If 2 dozen were broken and had to be thrown away, at what price per dozen must he sell the remainder in order to make a gross profit of $4.00 on the entire lot?

6. On the morning of September 12, the checkbook balance of Conwell Higgins was $201.03. On September 12, 13, and 14 he performed the following transactions:

Sept. 12. Deposited $16.29. Issued checks for $4.28 and $18.72.
13. Deposited $24.75 and $19.57. Issued check for $9.77.
14. Deposited $7.24 and $13.68. Issued checks for $12.33 $1.09, $40.67, and $8.98.

Find the amount of his checkbook balance at the end of each of the three days.

Section 5 . . . Determining Average Prices

Simple Averages. If a person has purchased several articles of the same kind at different unit prices, he may wish to know the average price that he has paid. An *average* is the quotient obtained by adding a series of numbers and dividing that sum by the number of items added.

Example

During last week a housewife purchased three dozen eggs. She paid 66¢ for the first dozen, 67¢ for the second, and 71¢ for the third. What average price per dozen did she pay for the three dozen eggs?

Solution

$.66
.67
.71
$2.04, cost of 3 dozen
$2.04 ÷ 3 = $.68, average cost of 1 dozen. Ans.

Weighted Averages. In the foregoing example, only one dozen eggs was purchased at each of the three unit prices. In many problems involving the calculation of averages, the quantity at a given unit price is often more than one unit. In such cases, the average should be calculated by first finding the product of each quantity and its corresponding unit price, and then dividing the sum of the products by the sum of the quantities. An average computed in this manner is called a *weighted average.*

Example

During last week a boarding-house keeper purchased seven dozen eggs as follows: 2 doz. @ 66¢; 1 doz. @ 67¢; and 4 doz. @ 71¢. What average price per dozen did she pay for the seven dozen eggs?

Solution

2 doz. @ $.66 = $1.32
1 doz. @ $.67 = .67
4 doz. @ $.71 = 2.84
7 doz. $4.83
$4.83 ÷ 7 = $.69 Ans.

Finding a Missing Item in a Series. In certain problems pertaining to averages, the average of the series and the values of all the items in the series except one are given in the problem. The value of the missing item is to be found. The method of finding the missing item is shown by the solution of the example given at the top of page 42.

Example: During one heating season, from September to June, a homeowner purchased 10 tons of coal at an average cost of $18.40 a ton. He paid $18.00 a ton for the first 5 tons, and $18.75 a ton for the next 4. What was the price of the last ton that he purchased?

Solution: *$18.00 × 5 = $90, amount paid for 5 tons.*
$18.75 × 4 = 75, amount paid for 4 tons.
$165, amount paid for 9 tons.
$18.40 × 10 = $184, amount paid for 10 tons.
$184 − $165 = $19, amount paid for last ton. Ans.

Exercise 23. (*Written*)

1. During one week, Mrs. Henry Carey, a boardinghouse keeper, bought one dozen grapefruit @ 87¢, one dozen @ 80¢, and one dozen at 85¢. Find the average cost per dozen of the grapefruit she purchased during the week.

2. During one heating season, Charles Doyle, a householder, purchased 4.8 tons of coal @ $22.40, 3.6 tons @ $24.20, and 2.2 tons @ $23.85. Find to the nearest cent the average cost per ton of the coal purchased during the season.

3. On an automobile trip, Earl Pitts purchased gasoline as follows: 10 gal. @ 28.5; 15 gal. @ 29.6¢; 5 gal. @ 26.4; 12 gal. @ 27.3¢. What average price per gallon, to the nearest tenth of a cent, did he pay for the gasoline purchased on the trip? 28.3

4. Grace Lewis, a high school student, allows herself an average of 45¢ a day for her lunch at school. If she spent 48¢ on Monday, 43¢ on Tuesday, 45¢ on Wednesday, and 42¢ on Thursday, how much may she spend for lunch on Friday? 47¢

5. During one heating season, Ralph Prince, a homeowner, purchased 715 gallons of fuel oil at a total cost of $89.93. He paid 12.3¢ per gallon for the first 260 gallons, and 12.6¢ per gallon for the next 275 gallons. What average price per gallon, to the nearest tenth of a cent, did he pay for the remainder of the oil he purchased during the season? 12.9

6. A boy has had four monthly tests in business arithmetic with the following ratings: 82%, 81%, 90%, and 84%. What rating must he receive on the next test in order that he may have an average of 85% for the five tests? 88

DIVISION (Concluded)

Estimating the Quotient. Either before or immediately after dividing, you should make an estimate of the quotient to check the location of the decimal point and to avoid an absurd answer to the problem. To estimate the quotient, round the divisor and the dividend to numbers that can be divided mentally or that can be divided readily by short division.

Example: Find the exact quotient and the estimated quotient of 399 ÷ 7,125.

Solution

Exact Quotient

(The calculations that are necessary for this division are omitted.)

$$\begin{array}{r} .056 \\ 7125\overline{)399.000} \end{array}$$

.056 Ans.

Estimated Quotient

The divisor, 7,125 may be rounded to 7,000, the approximate divisor.

The dividend, 399, may be rounded to 420, the approximate dividend, which is close to 399 and which may be readily divided by the 7 in the approximate divisor.

420 ÷ 7,000 = .42 ÷ 7 = .06, estimated quotient.

In the example given above, the estimated quotient is .06, and the exact quotient is .056. Since the estimated quotient is .06, the exact quotient, .056, is not an unreasonable answer to the problem. On the other hand, if the exact quotient were a number such as .56, or .0056, it would be known at once to be an unreasonable or absurd answer, since .56 is ten times the estimated quotient, and .0056 is one tenth of the estimated quotient. In such a case, however, the estimated quotient should be calculated again to make sure that it is correct before concluding that the exact quotient is incorrect.

Study the following additional examples illustrating the method of estimating the quotient.

	Approximate Divisor	Approximate Dividend	Estimated Quotient
a. 7,668 ÷ 42	40	8,000	200
b. 4,608 ÷ 36	40	4,400	110
c. 316.4 ÷ 14.72	15	300	20
d. 4,275 ÷ 25.9	30	4,200	140
e. 4,927 ÷ 26.2	25	5,000	200

Exercise 24. (*Oral*)

Explain how the estimated quotient was obtained in each of the following:

1. 1,586 ÷ 832 is about 2.
2. 597 ÷ 17 is about 30.
3. 756.8 ÷ 25.7 is about 30.
4. $6,120 ÷ 45 is about $120.
5. $426.80 ÷ 49 is about $8.
6. $7,285.40 ÷ 35 is about $200.

Exercise 25. (*Written*)

Estimate the quotient in each of the following. Wherever it is possible, make the estimate mentally, without the aid of written calculations, writing the estimated quotient only.

	1.	2.	3.	4.
a.	$2,126 ÷ 32	$16,876 ÷ 513	.3627 ÷ .23	3.64 ÷ 10.6
b.	$3,285 ÷ 43	26.3 ÷ 2.18	6.85 ÷ .823	.27 ÷ .073
c.	$2,848 ÷ 49	263.8 ÷ 2,354	7.346 ÷ 9.25	21.44 ÷ 813

Division to a Stated Number of Decimal Places. Problems involving the division of decimals usually require that the answers be given correct to a stated number of decimal places. In such cases, the division must be carried one place beyond the stated number of places. The quotient is then rounded to the number of places stated in the problem. *In cases where the answer is in dollars and cents, the final result is given to the nearest cent if the problem does not specify the number of decimal places in the answer.*

Example: Find the average cost per gallon of fuel oil, to the nearest *tenth* of a cent, if 1,231 gallons cost $151.15.

Solution

$ .1227
1231)$151.1500
Ans. $.123 or 12.3¢

Explanation

Since the third decimal place is the position of the figure representing tenths of a cent, the answer is to be given correct to *three* decimal places.

The quotient is therefore carried to four places. Since the last figure in the quotient is 7, the preceding figure is increased by 1. Rounded to three decimal places, the quotient is .123.

Exercise 26. (*Written*)

In each of the following problems (a) estimate the quotient, (b) perform the division and give the answer correct to the number of decimal places indicated, and (c) prove the quotient.

	1. To 3 decimal places	2. To the nearest *hundredth*	3. To the nearest *tenth* of a cent
a.	264.5 ÷ 2,345	34.1 ÷ 2.13	$17.54 ÷ 504
b.	7.438 ÷ 9.08	3.45 ÷ .412	$39.05 ÷ 304
c.	.3544 ÷ .22	45 ÷ .1312	$96.71 ÷ 412

End Ciphers in the Divisor. When there are end ciphers on the right of the divisor and the divisor is a whole number, strike off the end ciphers before dividing and move the decimal point in the dividend to the left as many places as there are ciphers struck off in the divisor.

Example: What is the average cost per gallon of fuel oil, to the nearest tenth of a cent, if 1,700 gallons cost $193.15.

Solution

$193.15 ÷ 1,700 = ?

$$\begin{array}{r} .11\ 36 \\ 17\cancel{0}\cancel{0})\overline{1.\underset{\curvearrowleft}{93}.15} \end{array}$$

$.114, or 11.4¢ Ans.

Explanation

Striking off the end ciphers in the divisor and moving the decimal point to the left two places in the dividend results in dividing both the dividend and the divisor by 100. This does not change the value of the quotient.

Exercise 27. (*Written*)

In each of the following problems (a) estimate the quotient, (b) perform the division and give the answer correct to the number of decimal places indicated, and (c) prove the quotient.

	1. To 2 decimal places	2. To 3 decimal places	3. To 4 decimal places
a.	276 ÷ 140	413 ÷ 11,800	291.5 ÷ 2,500
b.	27.2 ÷ 510	880 ÷ 2,400	2,100 ÷ 8,200
c.	340 ÷ 3,500	410 ÷ 7,400	191,300 ÷ 76,520,000

Problems for Application and Review

1. (a) Divide 20.62 by 802, correct to 3 decimal places. (b) Find the cost of 1,280 articles at 95¢ per C. (c) .72 × what number = 54? (d) Find the product of 1,280 × 10,500. (e) What number divided by 3.5 gives 70?

2. On May 31, George Easton's checkbook balance was $949.48. The bank statement on that date showed a balance of $963.84. Comparison of the checkbook with the statement and returned checks revealed the following discrepancies: (1) A check for $24.50, which Mr. Easton had deposited and added to the checkbook balance on May 22, had been returned because of "insufficient funds," but this fact had not been recorded in the checkbook. (2) A deposit of $18.75 mailed to the bank on May 31 had not been recorded on the bank statement. (3) The amount of one of the canceled checks, No. 214, was $34.44 while the amount on the checkbook stub was $44.34. (4) The outstanding checks were: No. 210 for $12.17; No. 211 for $9.45; No. 215 for $21.37; No. 216 for $4.72. Reconcile the balances.

3. The Office Supplies Company keeps a record of the sales of its representatives. White's average weekly sales for 10 weeks were $495.75. His sales for the 11th and 12th weeks were $463.50 and $502.20, respectively. (a) Find White's total sales for the 12 weeks. (b) Find his average weekly sales for the 12 weeks.

4. A girl received 75%, 87%, 93%, and 81%, respectively, on the first four tests in business arithmetic. What per cent must she receive on the fifth test in order that she may have an average of 85% for the five tests?

5. A haberdasher bought 300 pairs of men's hose at $4.60 a dozen pairs and sold them at the rate of 3 pairs for $1.75. What was his average gross profit per pair?

6. A fruit dealer bought a crate of strawberries (32 quarts) for $11.40. If 4 quarts were spoiled and unsalable, at what price per quart must he sell the remainder if he desires a gross profit of $4.00 on the entire transaction?

7. Fleming dictated 20 letters to his secretary is 2 hours. She spent a total of 5 hours taking the dictation and typing the letters. Fleming's salary was $28 a day for 8 hours; his secretary's salary was $12.80 a day for 8 hours. Other expenses averaged 10¢ a letter. What was the average total cost per letter?

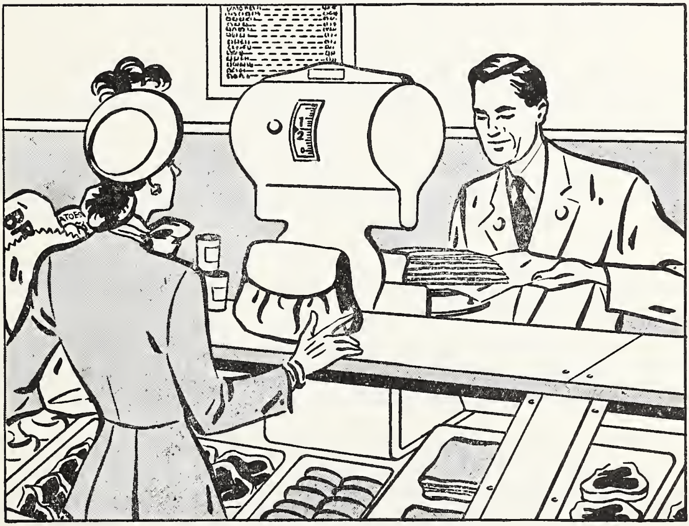
UNIT III

PROBLEMS OF PERSONAL BUYING

Section 1 . . . Buying in Fractional Quantities

Finding the Cost of a Fractional Quantity. The unit price of an article is the price for one pound, one dozen, and the like. To find the cost of a fractional quantity, multiply the unit price by the fraction. For example, if you purchase $\frac{2}{3}$ dozen oranges at 48¢, the cost would be calculated by multiplying 48¢ by $\frac{2}{3}$. This is done by dividing 48 by 3 and multiplying the quotient by 2.

48¢ $\div$ 3 $=$ 16¢, cost of $\frac{1}{3}$ dozen
16¢ $\times$ 2 $=$ 32¢, cost of $\frac{2}{3}$ dozen



Purchase of a Fractional Quantity

If the price per dozen oranges had been 53¢, instead of 48¢, the cost of $\frac{2}{3}$ dozen would have been calculated by multiplying 53 by 2 and dividing the product by 3, because the unit price, 53¢, is not exactly divisible by 3.

$$53¢ \times 2 = \$1.06, \text{ cost of 2 dozen}$$
$$\$1.06 \div 3 = 35\tfrac{1}{3}¢, \text{ or } 35¢, \text{ cost of } \tfrac{2}{3} \text{ dozen}$$

When the price, 53¢, is multiplied by the quantity, $\frac{2}{3}$ dozen, the answer contains a fraction. As payment must be made in even cents, the fraction must be eliminated. In some stores, any fraction of a cent is treated as an additional cent. In others, only a fraction equal to or greater than $\frac{1}{2}$ is treated as an additional cent. In the latter case, $35\frac{1}{3}$¢ is expressed as 35¢, and $35\frac{1}{2}$¢ as 36¢.

In solving the problems in this text, follow the latter procedure whenever a product containing a fraction must be expressed in even cents, except where directions are given to the contrary.

Exercise 1. (*Written*)

1. Myrtle Chapman makes the following purchases from the Westlyn Department Store: $\frac{3}{4}$ yd. gingham @ $1.16; $\frac{5}{6}$ yd. rayon crepe @ $1.68; $\frac{8}{9}$ yd. velvet @ $3.69. In payment she gives the clerk a $10 bill. How much change does she receive?

2. Mrs. Louis Drexel made the following purchases at the Colvin Market: $\frac{7}{8}$ lb. steak @ $1.09; $\frac{3}{4}$ lb. tea @ $1.40; $\frac{5}{8}$ lb. nut meats @ $1.25. She gave a $5 bill in payment. How much change should she receive?

3. Marion Cullen purchases 28 inches of ribbon priced at 79¢ a yard. (a) The quantity purchased is what fractional part of a yard? (b) What is the cost of the purchase?

4. A housewife purchases 9 oranges priced at 57¢ a dozen. (a) What fractional part of a dozen does she purchase? (b) What is the cost of the purchase?

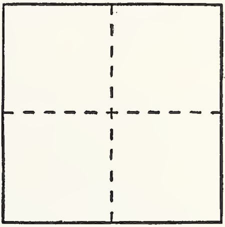
5. A housewife purchases a small steak weighing 14 ounces priced at $1.07 a pound. (a) The quantity purchased is what fractional part of a pound? (b) What is the cost of the purchase?

6. Mrs. Byron Jones makes the following purchases at the Empire Market: 10 oz. bacon @ 69¢ a pound; 14 oz. lamb chops @ 91¢ a pound; 13 oz. salt pork @ 63¢ a pound; 8 grapefruit @ 88¢ a dozen. If she gives in payment a $5 bill, what change does she receive?

COMMON FRACTIONS

Fractional Units. When a quantity that is less than a unit is purchased, the quantity purchased is expressed as one or more of the equal parts into which the unit is divided. A pound of meat, for example, may be thought of as being divided into four equal parts, each part representing one fourth of a pound. If three such parts are purchased, the quantity purchased is said to be three fourths of a pound.

Each of the equal parts into which a unit, or a whole, may be divided is referred to as a *fractional unit.* For example, if a square piece of paper is divided into four equal parts, as in the illustration at the right, each part is a fractional unit.



If a unit is divided into two equal parts, each part, or fractional unit, is referred to as *one half.* Similarly, a fractional unit may be referred to as *a third* or *one fourth,* etc., depending upon the number of equal parts into which the unit is divided.

Expressing a Unit in Terms of Fractional Units. A unit consists of as many fractional units as the number of equal parts into which the unit is divided. If a pie is cut into two equal parts, or into halves, the whole pie consists of *two halves*; if it is divided into thirds, the whole consists of *three thirds*; if divided into fourths, it consists of *four fourths*; and so on. Hence, two halves, three thirds, or four fourths, etc., expresses the whole of the unit, or *one* unit.

Fractional Units Treated as Things. Fractional units may be considered as *things.* We may therefore add, subtract, multiply, and divide various numbers of fractional units in the same manner as we add, subtract, multiply, and divide various numbers of other kinds of things, such as apples, books, or pencils. Just as

1 apple + *1 apple* = *2 apples*, so
1 third + *1 third* = *2 thirds.*

Examples of addition, subtraction, multiplication, and division with fractional units are given at the top of page 50 in the column at the right. Compare each of these examples with the example that is opposite, in the column at the left, and observe the similarity.

2 apples + 3 apples = 5 apples	*2 sixths + 3 sixths = 5 sixths*
7 books − 4 books = 3 books	*7 eighths − 4 eighths = 3 eighths*
2 × 4 pencils = 8 pencils	*2 × 4 ninths = 8 ninths*
15 dollars ÷ 5 = 3 dollars	*15 sixteenths ÷ 5 = 3 sixteenths*

Observe that in each example we have added, subtracted, multiplied, or divided the *number* of things without changing the *kind* of things, or the *name* of the things.

Exercise 2. (Oral)

1. State the result of the operation indicated in each of the following:

(a) 1 fifth + 3 fifths $\frac{4}{5}$
(b) 9 tenths − 6 tenths $\frac{3}{10}$
(c) 5 × 3 sixteenths $\frac{15}{16}$
(d) 10 twelfths ÷ 2 $\frac{5}{12}$
(e) 2 × 4 fifteenths $\frac{8}{15}$
(f) 5 sixths − 4 sixths $\frac{1}{6}$
(g) 14 fifteenths ÷ 7 $\frac{2}{15}$
(h) 3 × 6 twenty-fourths $\frac{18}{24} = \frac{3}{4}$
(i) 3 ninths + 5 ninths $\frac{8}{9}$
(j) 8 eighths ÷ 8 $\frac{1}{8}$
(k) 7 fifths − 3 fifths $\frac{4}{5}$
(l) 2 tenths + 7 tenths $\frac{9}{10}$

2. In each of the following, give the number that may be substituted for the question mark (?).

(a) 1 unit = ? sixths 6
(b) 2 units = ? thirds 6
(c) 4 units = ? eighths 32
(d) ? fourths = 3 units 12
(e) 4 units = ? halves 8
(f) ? fifths = 2 units 10

3. How many units are expressed by each of the following:

(a) 12 twelfths 1
(b) 12 fourths 3
(c) 12 thirds 4
(d) 5 fifths 1
(e) 20 fourths 5
(f) 6 thirds 2
(g) 7 sevenths 1
(h) 24 eighths 3

4. For each of the following, state whether the value expressed is smaller than, equal to, or greater than 1 unit. Give the reason for your answer.

(a) 3 fifths <
(b) 9 eighths >1
(c) 4 thirds >1
(d) 3 fourths <1
(e) 9 ninths 1
(f) 5 twelfths <1
(g) 16 fifteenths >1
(h) 15 sixteenths <1

Writing Fractions. When a quantity or value is expressed in fractional units, the expression is called a *fraction*.

A fraction may be written in words or in figures; for example, in the form *three fourths* or $\frac{3}{4}$. In the latter form, the number above the line is called the *numerator* and the number below the line is called the *denominator*. A fraction written in this form is called a *common fraction*.

Reducing a Fraction to Lowest Terms. The numbers used to express a fraction are its *terms*. A fraction may be reduced to lowest terms by dividing both terms by the largest common factor*; that is, the largest whole number that is exactly divisible into both the numerator and the denominator. Examples of this process are illustrated below:

$$\frac{6\ (\div 2)}{16\ (\div 2)} = \frac{3}{8} \qquad \frac{8\ (\div 4)}{12\ (\div 4)} = \frac{2}{3} \qquad \frac{75\ (\div 25)}{100\ (\div 25)} = \frac{3}{4}$$

Whenever the answer to a problem is a fraction, the fraction should be given in its lowest terms.

Raising a Fraction to Higher Terms. A fraction may be raised to higher terms by multiplying both terms by the same number. To illustrate:

$$\frac{2\ (\times 4)}{3\ (\times 4)} = \frac{8}{12} \qquad \frac{3\ (\times 3)}{4\ (\times 3)} = \frac{9}{12}$$

If it is desired to express $\frac{2}{3}$ in terms of twelfths, multiply the numerator and denominator by 4. To express $\frac{3}{4}$ in terms of twelfths, multiply the numerator and denominator by 3.

Exercise 3. (Oral)

1. Reduce to lowest terms: $\frac{6}{10}$, $\frac{7}{21}$, $\frac{5}{20}$, $\frac{27}{33}$, $\frac{10}{15}$, $\frac{15}{18}$, $\frac{20}{24}$, $\frac{18}{27}$.

2. Express each of the following fractions with a denominator of 12: $\frac{1}{2}$, $\frac{2}{3}$, $\frac{3}{4}$, $\frac{5}{6}$.

3. Reduce to lowest terms: $\frac{9}{12}$, $\frac{14}{21}$, $\frac{5}{15}$, $\frac{6}{12}$, $\frac{27}{36}$, $\frac{12}{18}$, $\frac{8}{16}$, $\frac{9}{21}$.

4. Express each of the following with a denominator of 36: $\frac{1}{2}$, $\frac{3}{4}$, $\frac{2}{3}$, $\frac{4}{9}$, $\frac{5}{12}$, $\frac{7}{18}$.

5. Reduce to lowest terms: $\frac{18}{20}$, $\frac{6}{18}$, $\frac{5}{25}$, $\frac{25}{30}$, $\frac{13}{26}$, $\frac{16}{28}$, $\frac{5}{20}$, $\frac{14}{28}$.

A Fraction Expresses the Division of One Number by Another. A fraction may be used to express the division of one number by another. The number representing the dividend is written as the numerator of the fraction, and the number representing the divisor is written as the denominator. Thus, 3 divided by 4 may be expressed by the fraction $\frac{3}{4}$; and the fraction $\frac{3}{4}$ may be thought of as the quotient of $3 \div 4$.

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*A factor of a number is a divisor of that number.

If three chocolate bars are divided equally among 4 persons each person receives $\frac{1}{4}$ of the first bar, $\frac{1}{4}$ of the second, and $\frac{1}{4}$ of the third. That is, he receives $\frac{1}{4} + \frac{1}{4} + \frac{1}{4}$, which is equivalent to $\frac{3}{4}$ of one bar. Hence, $3 \div 4$ equal $\frac{3}{4}$.

Proper Fractions and Improper Fractions. When the numerator of a fraction is smaller than the denominator, the fraction is a *proper fraction.* When the numerator is equal to or greater than the denominator, the fraction is an *improper fraction.* Thus, $\frac{3}{4}$, $\frac{5}{6}$, and $\frac{9}{10}$ are proper fractions; and $\frac{5}{5}$, $\frac{9}{4}$, and $\frac{12}{7}$ are improper fractions.

The value of a proper fraction is *less* than a unit. The value of an improper fraction is equal to or *more* than a unit.

Changing an Improper Fraction to a Mixed Number. A *mixed number* is one that consists of a whole number and a fraction. Thus, $5\frac{3}{4}$ is a mixed number. It means $5 + \frac{3}{4}$, or 5 units $+ \frac{3}{4}$ of a unit.

When fractional quantities are added, the result is often an improper fraction. Unless directions are given to the contrary, when the answer to a problem is an improper fraction, it should be changed to a mixed number. Since a fraction represents division, *to change an improper fraction to a mixed number, divide the numerator by the denominator.* Thus,

$$\frac{23}{4} = 23 \div 4 = 5\frac{3}{4}$$

Exercise 4. (Oral)

State the mixed number or whole number that is equivalent to the improper fraction in each of the following.

	1.	2.	3.	4.	5.	6.
a.	$\frac{19}{2}$	$\frac{16}{4}$	$\frac{62}{10}$	$\frac{66}{12}$	$\frac{27}{3}$	$\frac{28}{8}$
b.	$\frac{33}{5}$	$\frac{9}{5}$	$\frac{43}{7}$	$\frac{19}{9}$	$\frac{20}{6}$	$\frac{45}{12}$

Addition and Subtraction of Like Fractions. Fractions, such as $\frac{2}{7}$ and $\frac{3}{7}$, which have the same denominator, are called *like fractions* and are said to have a *common denominator.*

Just as 2 pounds + 3 pounds = 5 pounds, so 2 sevenths + 3 sevenths = 5 sevenths.

$$\frac{2}{7} + \frac{3}{7} = \frac{5}{7}$$

Similarly, just as 7 dollars − 2 dollars = 5 dollars, so 7 ninths − 2 ninths = 5 ninths.

$$\frac{7}{9} - \frac{2}{9} = \frac{5}{9}$$

Hence, to add or subtract like fractions, add or subtract the numerators, as the case may be, and write the result over the common denominator.

Addition and Subtraction of Unlike Fractions. Fractions that have different denominators are called *unlike fractions*. The fractions $\frac{2}{3}$ and $\frac{3}{4}$, for example, are unlike fractions because they do not have the same denominator.

Only like things can be added or subtracted. Therefore, to add $\frac{2}{3}$ and $\frac{3}{4}$, the fractions must be raised to $\frac{8}{12}$ and $\frac{9}{12}$, respectively, which are like fractions. The sum of the original fractions, $\frac{2}{3}$ and $\frac{3}{4}$, may then be found by adding their equivalents, $\frac{8}{12}$ and $\frac{9}{12}$. Thus,

$$\frac{2}{3} + \frac{3}{4} = \frac{8}{12} + \frac{9}{12} = \frac{17}{12} = 1\frac{5}{12}$$

The subtraction of unlike fractions is accomplished in a similar manner. Thus,

$$\frac{3}{4} - \frac{2}{3} = \frac{9}{12} - \frac{8}{12} = \frac{1}{12}$$

Least Common Denominator. In adding and subtracting unlike fractions, the number used as the common denominator may be any number that is a multiple of the denominators. It is customary, however, to use the least common multiple of the denominators. Such a number is called the *least common denominator* of the fractions.

A *multiple* of a number is the product of that number and an integer. A *common multiple* of two or more numbers is a number that is a multiple of each. The *least common multiple* of two or more numbers is the smallest number that is a multiple of each.

Exercise 5. (Oral)

1. State the least common denominator of the fractions in each of the following.

a. $\frac{3}{8}, \frac{1}{2}$
b. $\frac{3}{4}, \frac{5}{12}$
c. $\frac{7}{16}, \frac{3}{8}$
d. $\frac{2}{3}, \frac{3}{4}$
e. $\frac{5}{8}, \frac{2}{3}$
f. $\frac{3}{4}, \frac{4}{5}$
g. $\frac{3}{4}, \frac{1}{6}$
h. $\frac{5}{6}, \frac{3}{8}$
i. $\frac{3}{10}, \frac{1}{4}$
j. $\frac{3}{4}, \frac{5}{8}, \frac{1}{16}$
k. $\frac{2}{3}, \frac{1}{4}, \frac{5}{12}$
l. $\frac{2}{3}, \frac{3}{4}, \frac{1}{2}$
m. $\frac{1}{4}, \frac{3}{8}, \frac{1}{6}$
n. $\frac{7}{10}, \frac{3}{4}, \frac{1}{2}$
o. $\frac{5}{6}, \frac{1}{4}, \frac{3}{8}$

2. In each set of fractions given in Problem 1, express each fraction in terms of a fraction whose denominator is the same as the least common denominator of the fractions in that set.

3. State the sum of the fractions in each of the following.

a. $\frac{2}{7} + \frac{4}{7}$
b. $\frac{8}{15} + \frac{2}{15}$
c. $\frac{3}{8} + \frac{3}{8}$
d. $\frac{5}{6} + \frac{3}{6}$
e. $\frac{11}{12} + \frac{5}{12}$
f. $\frac{7}{16} + \frac{11}{16}$
g. $\frac{1}{6} + \frac{2}{3}$
h. $\frac{3}{8} + \frac{5}{16}$
i. $\frac{3}{4} + \frac{7}{8}$
j. $\frac{1}{2} + \frac{2}{3}$
k. $\frac{5}{6} + \frac{1}{4}$
l. $\frac{1}{8} + \frac{1}{12}$
m. $\frac{2}{3} + \frac{5}{6}$
n. $\frac{3}{4} + \frac{1}{3}$
o. $\frac{1}{4} + \frac{5}{6}$
p. $\frac{2}{3} + \frac{3}{4}$
q. $\frac{3}{4} + \frac{5}{6}$
r. $\frac{1}{6} + \frac{3}{8}$
s. $\frac{3}{4} + \frac{5}{8} + \frac{1}{2}$
t. $\frac{3}{4} + \frac{3}{8} + \frac{3}{16}$
u. $\frac{1}{2} + \frac{7}{8} + \frac{1}{4}$
v. $\frac{1}{2} + \frac{1}{6} + \frac{2}{3}$
w. $\frac{5}{6} + \frac{5}{12} + \frac{1}{4}$
x. $\frac{5}{8} + \frac{1}{2} + \frac{5}{16}$

4. State the difference in each of the following.

a. $\frac{11}{12} - \frac{5}{12}$
b. $\frac{5}{6} - \frac{1}{6}$
c. $\frac{7}{9} - \frac{4}{9}$
d. $\frac{13}{16} - \frac{3}{16}$
e. $\frac{11}{16} - \frac{7}{16}$
f. $\frac{3}{4} - \frac{1}{8}$
g. $\frac{5}{8} - \frac{3}{16}$
h. $\frac{5}{6} - \frac{1}{3}$
i. $\frac{2}{3} - \frac{5}{12}$
j. $\frac{5}{6} - \frac{1}{2}$
k. $\frac{2}{3} - \frac{1}{6}$
l. $\frac{11}{12} - \frac{1}{4}$
m. $\frac{1}{2} - \frac{5}{12}$
n. $\frac{3}{4} - \frac{1}{3}$
o. $\frac{3}{5} - \frac{1}{2}$
p. $\frac{3}{4} - \frac{1}{6}$
q. $\frac{2}{3} - \frac{1}{2}$
r. $\frac{5}{6} - \frac{1}{4}$
s. $\frac{2}{3} - \frac{1}{5}$
t. $\frac{5}{6} - \frac{3}{4}$

Addition of Mixed Numbers. Just as you may purchase two or more fractional amounts, you may purchase two or more amounts expressed as mixed numbers. In this case you must be able to add mixed numbers to find the total amount purchased.

Example: During one month, Mrs. Earl White, a housewife, purchased three dressed fowl weighing $5\frac{7}{8}$ pounds, $7\frac{3}{16}$ pounds, and $6\frac{3}{4}$ pounds, respectively. What was the total weight of the fowl she purchased during the month?

Solution

	16ths
$5\frac{7}{8}$	*14*
$7\frac{3}{16}$	*3*
$6\frac{3}{4}$	*12*

$18 + \frac{29}{16} = 19\frac{13}{16}$ *Ans.*

Explanation

The mixed numbers are arranged in a column, at the left, and the sum of the integers is found. The sum is 18.

The L. C. D. (least common denominator) of the fractions is 16. The fractions are therefore changed to 16ths, and the numerators of the equivalent fractions are written in a column at the right. The numerators are added, and the sum, 29, is written as $\frac{29}{16}$.

The sum of the integers, 18, is then combined with the sum of the fractions, $\frac{29}{16}$, giving $19\frac{13}{16}$ $(18 + 1\frac{13}{16})$.

Subtraction of Mixed Numbers. The subtraction of mixed numbers is performed in much the same manner as the addition of mixed numbers.

Example: Subtract $34\frac{5}{6}$ from $56\frac{3}{8}$.

Solution

$$\begin{array}{r|l} & \mathit{24ths} \\ \cline{2-2} 5 & 33 \\ 5\cancel{6}\frac{3}{8} & \cancel{9} \\ 34\frac{5}{6} & 20 \\ \hline \end{array}$$

$21 + \frac{13}{24} = 21\frac{13}{24}$ *Ans.*

Explanation

The L. C. D. of the fractions is 24. The fractions are therefore changed to 24ths, and the numerators of the equivalent fractions are written in the column at the right.

Since 20 twenty-fourths cannot be subtracted from 9 twenty-fourths, 24 twenty-fourths (or 1 unit) are borrowed and added to the 9 twenty-fourths, giving 33 as the new minuend in the column at the right.

Now 20 is subtracted from 33, leaving 13, which is written as $\frac{13}{24}$.

The integers are subtracted, and the difference, 21, is combined with the difference between the fractions, $\frac{13}{24}$, giving $21\frac{13}{24}$.

Exercise 6. (Written)

1. Find the sum of each of the following. Show all the necessary calculations.

a.	*b.*	*c.*	*d.*	*e.*	*f*	*g.*	*h.*	*i.*	*j.*
$3\frac{4}{5}$	$4\frac{2}{3}$	$4\frac{5}{6}$	$5\frac{2}{9}$	$7\frac{11}{16}$	$6\frac{5}{6}$	$3\frac{5}{6}$	$8\frac{3}{5}$	$\frac{3}{4}$	$\frac{4}{5}$
$2\frac{2}{3}$	$8\frac{3}{8}$	$8\frac{3}{4}$	$8\frac{1}{3}$	$3\frac{1}{3}$	$2\frac{2}{3}$	$\frac{1}{2}$	$\frac{5}{9}$	$\frac{8}{9}$	$\frac{5}{8}$
$5\frac{1}{6}$	$5\frac{3}{4}$	$6\frac{2}{3}$	$2\frac{5}{6}$	$1\frac{5}{12}$	$\frac{4}{5}$	$4\frac{2}{9}$	$\frac{1}{3}$	$1\frac{5}{6}$	$\frac{2}{3}$

2. Perform the subtraction in each of the following. Show all the necessary calculations.

a.	*b.*	*c.*	*d.*	*e.*	*f.*
$63\frac{2}{3}$	$104\frac{3}{4}$	$321\frac{5}{8}$	$89\frac{5}{12}$	$400\frac{8}{9}$	$300\frac{9}{10}$
$27\frac{3}{4}$	$49\frac{5}{6}$	$154\frac{13}{16}$	$54\frac{1}{15}$	$269\frac{11}{12}$	$198\frac{14}{15}$

Multiplication of a Whole Number and a Fraction. When a fractional quantity is purchased and the price is in even cents, it is necessary to multiply the price, expressed as a whole number, by the quantity, expressed as a fraction, to find the cost of the purchase. It is essential, therefore, that you be able to multiply a whole number and a fraction.

To find the product of a whole number and a fraction, multiply the numerator by the whole number, and divide by the denominator. Thus,

$$13 \times \frac{3}{8} = \frac{13 \times 3}{8} = \frac{39}{8} = 4\frac{7}{8}$$

If the denominator and the whole number contain a common factor, it may be eliminated by cancellation before multiplying the numerator. To illustrate:

(*a*) $$15 \times \frac{7}{12} = \overset{5}{\cancel{15}} \times \frac{7}{\underset{4}{\cancel{12}}} = \frac{35}{4} = 8\frac{3}{4}$$

(*b*) $$\frac{3}{4} \times 24 = \frac{3}{\cancel{4}} \times \overset{6}{\cancel{24}} = 18$$

(*c*) $$4 \times \frac{5}{12} = \cancel{4} \times \frac{5}{\underset{3}{\cancel{12}}} = \frac{5}{3} = 1\frac{2}{3}$$

With fractions as with whole numbers, the multiplicand and multiplier may be interchanged without affecting the value of the product. For example, the product of 5 × 8 is the same as the product of 8 × 5. Likewise, the product of 24 × $\frac{3}{4}$ is the same as $\frac{3}{4}$ × 24. Therefore, the multiplication of $\frac{3}{4}$ by 24 may be expressed either as $\frac{3}{4}$ × 24 or as 24 × $\frac{3}{4}$.

The expression "$\frac{3}{4}$ of 24" means the same as "$\frac{3}{4}$ × 24." Hence, to find a fractional part of a number, we may multiply the number by the fraction.

Exercise 7. (*Oral*)

In each of the following, perform the indicated multiplication by the method that is most appropriate.

	1.	2.	3.	4.	5.
a.	$44 \times \frac{3}{4}$	$\frac{4}{9} \times 12$	$75 \times \frac{2}{3}$	$\frac{2}{5}$ of 9	$160 \times \frac{3}{4}$
b.	$\frac{2}{15} \times 3$	$153 \times \frac{2}{3}$	$9 \times \frac{1}{15}$	$4 \times \frac{5}{24}$	$\frac{2}{5}$ of 20
c.	$\frac{1}{12}$ of 8	$\frac{3}{16} \times 2$	$\frac{3}{4}$ of 15	$\frac{1}{16}$ of 6	$9 \times \frac{2}{5}$
d.	$4 \times \frac{3}{8}$	$3 \times \frac{7}{9}$	$248 \times \frac{3}{8}$	$\frac{5}{6}$ of 120	$\frac{8}{15} \times 5$
e.	$\frac{2}{3}$ of 14	$\frac{3}{10}$ of 8	$\frac{11}{12} \times 6$	$10 \times \frac{5}{12}$	$24 \times \frac{1}{32}$

Problems for Application and Review

Group A

1. (a) Find, to the nearest hundredth, the quotient of 12,870 ÷ 45,000. (b) Find the cost of 5,720 lb. at $14.20 per ton. (c) What number divided by 42 gives 2.1? (d) 1,220 × 2,800 = ? (e) 1.25 × what number = 45?

2. On April 1, the merchandise inventory of the Simmons Furniture Store was $47,483.67. During the following three months, the store's sales were $66,071.41, and its purchases were $39,642.85. The inventory on June 30 was $45,985.90. What was the gross profit for the three months?

3. A shoe dealer buys shoes at $6.50 a pair and sells them at $9.25 a pair. How many pairs will he have to buy and sell in order to realize a gross profit of $550?

4. A salesman's average sales for 9 weeks were $583.65 a week. After computing that average, he worked 3 weeks, and his sales amounted to $410.20, $563.80, and $367.10, respectively. Find his average weekly sales for the 12 weeks.

5. A boy has had four monthly tests in business arithmetic with the following ratings: 87%, 86%, 95%, 89%. What rating must he receive on the next test in order that he may have an average of 90% for the five tests?

Group B

1. (a) Divide 2.63 by 10.7, carrying the quotient to the nearest thousandth. (b) Find the cost of 745 lb. at 80¢ per cwt. (c) Divide 70 by 120, correct to 3 decimal places. (d) What number multiplied by .95 gives 228? (e) Subtract 28,965 from 39,020.

2. A clothier buys men's shirts at $21 a dozen and sells them at $2.40 each. How many shirts will he have to buy and sell in order to realize a gross profit of $139.75?

3. A haberdasher buys men's hose at 35¢ a pair and sells them at 3 pairs for $1.55. How many pairs will he have to buy and sell in order to realize a gross profit of $10?

4. For the last eight weeks of last year, Clark's average sales were $362.15 a week. For the first three weeks of the present year, his sales amounted to $415.16, $523.25, and $392.35, respectively. Find his average weekly sales for the eleven weeks.

5. A girl received 78%, 83%, and 91%, respectively, on the first three tests in business arithmetic. What mark must she receive on the fourth test in order that she may have an average of 85% for the four tests?

6. A store owner makes the following deposit at his bank: 98 pennies, 21 nickels, 41 dimes, 16 quarters, 27 half dollars, 9 one-dollar bills, 7 five-dollar bills, 4 ten-dollar bills, 1 twenty-dollar bill, and checks for $35.64, $38.60, $51.36, $42.98, $1.01, and $78.90. Find the amount of the deposit.

Group C

1. (a) Add $12\frac{2}{3}$, $8\frac{1}{4}$, and $11\frac{5}{6}$. (b) From $16\frac{1}{3}$, subtract $9\frac{5}{8}$. (c) 2.5 × what number = 62? (d) Find the cost of 28,800 ft. at $52.50 per M. (e) What number divided by 36 gives 18? (f) Divide 1,020.5 by 6.50.

2. A clothier bought 48 suits at $25 each and marked them to sell at $40. At the end of the season he has 8 suits left. To what price may he reduce each of the remaining suits and still make a gross profit of $650 on the 48 suits?

3. A grocer buys canned grapefruit juice at $2.61 a case (12 cans) and sells it at 28¢ a can. How many cases will he have to buy and sell in order to realize a gross profit of $56.25?

4. For the first four months of the year, the sales of the Glendale Grocery averaged $2,136.41 a month. For the next two months, the sales were $2,418.52 and $1,992.78, respectively. What were the average monthly sales for the six months?

5. A salesman's average sales for the first 11 months of the year are $3,678.50 a month. What must be the amount of his sales for the next month in order that his average monthly sales for the 12 months may be $3,750?

6. Mrs. Cornelius Wilkinson makes the following purchases at the Ideal Market: 14 ounces sirloin steak at $1.09 a pound; 12 ounces hamburg steak at 85¢ a pound; 13 ounces frankfurters at 65 ¢ a pound; 9 oranges at 54¢ a dozen; and 8 eggs at 67¢ at dozen. If she gives in payment a ten-dollar bill, what amount of change should she receive?

7. A grocer buys canned corn at $1.98 a dozen cans. If he sells them at the rate of two cans for 45 cents, what is his profit per can?

Section 2 . . Buying in Quantities or at Unit Prices Expressed as Mixed Numbers

Quantities and Prices Expressed as Mixed Numbers. A person may sometimes purchase a quantity expressed as a mixed number. Thus, he may buy $3\frac{5}{8}$ pounds of meat, $1\frac{1}{4}$ yards of linoleum, or $3\frac{2}{3}$ dozen oranges.

Unit prices, also, are often expressed as mixed numbers. For example, canned corn may be priced at $13\frac{1}{2}$¢ a can; toilet soap, at $5\frac{1}{2}$¢ a cake; crackers, at $18\frac{1}{2}$¢ a pound; copper wire, at $1\frac{3}{4}$¢ a foot; and so on.

Finding the Cost When the Quantity or the Unit Price Is a Mixed Number. To find the cost when the quantity or the unit price is a mixed number, the buyer should multiply the price or the quantity by each part of the mixed number separately and then add the results. For example, if Walter Elliott purchases $2\frac{3}{4}$ lb. of meat at 65¢, the computation of the cost would be as shown above.

$.65
$2\frac{3}{4}$
4)195
$48\frac{3}{4}$ ($\frac{3}{4}$ × 65)
130 (2 × 65)
1.78\frac{3}{4}$, or $1.79, cost of purchase

Exercise 8. (Written)

1. Ida West purchases the following materials from the Joslin Store: $3\frac{5}{8}$ yd. velveteen @ $3.65; $5\frac{3}{8}$ yd. dimity @ 87¢; $3\frac{3}{4}$ yd. percale @ 69¢. What is the total amount of the purchase?

2. A housewife purchases the following articles from Watson's Market: $2\frac{3}{8}$ lb. frankfurters @ 57¢; 6 cans corn @ 2 for 43¢; $12\frac{7}{8}$ lb. turkey @ 62¢; $\frac{3}{4}$ lb. bacon @ 69¢. If she gives in payment a $20 bill, what change does she receive?

3. Mrs. Frank Curtis purchases the following materials from the Perkins Silk Shop: $3\frac{3}{8}$ yd. plaid tweed @ $4.25; $2\frac{3}{4}$ yd. denim @ 98¢; $2\frac{7}{8}$ yd. rayon velvet @ $2.77; $2\frac{7}{8}$ yd. satin lining @ $1.43; 3 dress patterns @ 45¢. In payment she gives the clerk four $10 bills. How much change does she receive?

4. During the month of August, Mrs. Alice Porter, a housewife, made four purchases of chickens at the Fairlawn Market, the four chickens weighing $2\frac{5}{8}$ pounds, $3\frac{7}{16}$ pounds, $4\frac{1}{4}$ pounds, and $3\frac{7}{8}$ pounds, respectively. (a) If the price of chicken during August was 45¢ a pound, what amount did she pay for each chicken? (b) What was the total weight of the chickens that she purchased during the month?

5. Joyce Clark purchased four remnants of velvet containing $2\frac{1}{2}$ yards, $1\frac{2}{3}$ yards, $1\frac{3}{4}$ yards, and $2\frac{5}{6}$ yards, respectively. (a) What was the total number of yards that she purchased? (b) What was the total cost of the purchase if the price per yard was $1.92?

Finding the Cost When Both the Unit Price and the Quantity Are Expressed as Mixed Numbers. In finding the cost of a purchase when both the unit price and the quantity are mixed numbers, the buyer should multiply the fraction and the whole number in the multiplicand separately by the fraction and the whole number in the multiplier. If, for example, George Porter purchases $9\frac{1}{2}$ ft. of iron pipe priced at $15\frac{3}{4}$¢ a foot, the computation of the cost would be as shown above.

$\$.15\frac{3}{4}$	
$9\frac{1}{2}$	
$\frac{3}{8}$	$(\frac{3}{4} \times \frac{1}{2})$
$7\frac{1}{2}$	$(15 \times \frac{1}{2})$
$6\frac{3}{4}$	$(\frac{3}{4} \times 9)$
1 35	(15×9)
$\$1.48\frac{13}{8}$ =	$\$1.49\frac{5}{8}$, or $1.50, cost of purchase.

Exercise 9. (Written)

1. Hiram Jones, a farmer, purchases the following materials from the Farmers Supply House: 35 ft. steel pipe @ $17\frac{3}{4}$¢; 27 ft. steel pipe @ $18\frac{1}{4}$¢; 55 ft. wire fencing @ $27\frac{1}{2}$¢; 65 ft. manila rope @ $6\frac{3}{4}$¢. What is the total amount of the purchase?

2. Jack Reed, a tinsmith, purchases the following quantities of steel tubing from the Borg Company: 35 ft. @ $12\frac{1}{4}$¢; 15 ft. @ $13\frac{3}{4}$¢; 17 ft. @ $15\frac{3}{4}$¢. Find the total cost of the purchase.

3. A. E. Rooney, a plumber, makes the following purchases from Hoy's Supply Shop: $9\frac{3}{4}$ ft. steel pipe @ $24\frac{1}{4}$¢; $12\frac{3}{4}$ ft. steel pipe @ $25\frac{3}{4}$¢; $11\frac{1}{2}$ ft. steel pipe @ $27\frac{3}{4}$¢; 15 tees @ 38¢; 24 elbows @ 26¢. Find the total amount of the sales ticket.

4. Thomas Kennedy, an electrician, bought at the store of the Griswold Electric Supply Company the following articles: $13\frac{3}{4}$ ft. armored cable @ $18\frac{1}{2}$¢; $17\frac{1}{2}$ ft. service entrance cable @ $27\frac{1}{4}$¢; $22\frac{1}{2}$ ft. trench wire @ $8\frac{3}{4}$¢. What was the total amount of the sales ticket?

5. From the Cameron Hardware Store, Richard Kenney, a carpenter, purchases the following items: $13\frac{1}{2}$ ft. wire screening @ $25\frac{3}{4}$¢; $6\frac{1}{4}$ ft. wire screening @ $24\frac{1}{2}$¢; $19\frac{3}{4}$ ft. wire screening @ $18\frac{1}{4}$¢; 2 doz. corner irons @ 54¢; 3 pkg. copper tacks @ 15¢. Find the total amount of the sales ticket.

COMMON FRACTIONS (Continued)

Multiplication of a Whole Number and a Mixed Number. If you buy a quantity that is expressed as a mixed number, the cost of the purchase may be found by multiplying the price expressed as a whole number by the quantity expressed as a mixed number. When multiplying the whole number by the mixed number, multiply by each part of the mixed number separately and add the results.

Example (a): Multiply 23 by $7\frac{3}{4}$.

Example (b): Multiply $35\frac{3}{8}$ by 26.

Solution (a)

$$\begin{array}{r} 23 \\ \underline{7\frac{3}{4}} \\ 4)\underline{69} \\ 17\frac{1}{4} \\ \underline{161} \\ 178\frac{1}{4} \text{ Ans.} \end{array}$$

Explanation

The solution at the left shows the process of multiplying a whole number by a mixed number. 23 is multiplied by $\frac{3}{4}$ by multiplying by 3 and dividing by 4. The result is $17\frac{1}{4}$, which is the first partial product. The whole numbers are then multiplied in the usual manner.

Solution (b)

$$\begin{array}{r} 35\frac{3}{8} \\ \underline{26} \\ 8)\underline{78} \\ 9\frac{3}{4} \\ 210 \\ \underline{70} \\ 919\frac{3}{4} \text{ Ans.} \end{array}$$

The solution at the right shows the process of multiplying a mixed number by a whole number. 26 is multiplied by $\frac{3}{8}$ by multiplying by 3 and dividing by 8. The result is $9\frac{3}{4}$, which is the first partial product in the solution. The whole numbers are then multiplied in the usual manner.

Exercise 10. (Written)

Find the product in each of the following. Multiply each part of the mixed number separately and add the results.

	1.	2.	3.	4.	5.
a.	56 × $8\frac{1}{3}$	18 × $4\frac{11}{12}$	$26\frac{3}{4}$ × 15	$38\frac{5}{6}$ × 27	258 × $37\frac{2}{3}$
b.	$17\frac{3}{5}$ × 60	40 × $5\frac{7}{16}$	$32\frac{3}{8}$ × 22	496 × $7\frac{3}{4}$	597 × $42\frac{5}{8}$

Multiplication of a Fraction by a Fraction. *To multiply a fraction by a fraction, multiply the numerators to obtain the numerator of the product, and multiply the denominators to obtain the denominator of the product.* To illustrate,

$$\frac{2}{3} \times \frac{4}{5} = \frac{2 \times 4}{3 \times 5} = \frac{8}{15}$$

When there is a factor that is common to a numerator and a denominator, the common factor should be eliminated by cancellation before multiplying.

The product of three or more fractions is found in exactly the same manner as the product of two fractions, that is, by multiplying the numerators to obtain the numerator of the product, and by multiplying the denominators to obtain the denominator of the product. Thus,

$$\frac{6}{7} \times \frac{3}{4} \times \frac{11}{15} = \frac{\overset{3}{\cancel{6}}}{7} \times \frac{\cancel{3}}{\underset{2}{\cancel{4}}} \times \frac{11}{\underset{5}{\cancel{15}}} = \frac{33}{70}$$

Exercise 11. (*Oral*)

State the product in each of the following.

	1.	2.	3.	4.	5.
a.	$\frac{1}{3} \times \frac{3}{4}$	$\frac{3}{4}$ of $\frac{4}{25}$	$\frac{2}{5} \times \frac{5}{8}$	$\frac{3}{4}$ of $\frac{6}{25}$	$\frac{5}{8} \times \frac{4}{5} \times \frac{3}{4}$
b.	$\frac{5}{16} \times \frac{1}{5}$	$\frac{6}{7}$ of $\frac{2}{3}$	$\frac{9}{10} \times \frac{2}{3}$	$\frac{4}{9}$ of $\frac{5}{6}$	$\frac{8}{9} \times \frac{3}{8} \times \frac{2}{3}$
c.	$\frac{1}{2} \times \frac{8}{9}$	$\frac{8}{25}$ of $\frac{3}{4}$	$\frac{8}{9}$ of $\frac{3}{4}$	$\frac{5}{8}$ of $\frac{8}{9}$	$\frac{2}{3} \times \frac{3}{4} \times \frac{4}{5}$
d.	$\frac{12}{25} \times \frac{1}{4}$	$\frac{2}{3}$ of $\frac{3}{4}$	$\frac{4}{5}$ of $\frac{15}{16}$	$\frac{3}{5}$ of $\frac{25}{32}$	$\frac{5}{6} \times \frac{3}{4} \times \frac{3}{5}$
e.	$\frac{2}{3} \times \frac{3}{5}$	$\frac{4}{9}$ of $\frac{3}{4}$	$\frac{6}{7} \times \frac{5}{8}$	$\frac{8}{9}$ of $\frac{5}{12}$	$\frac{3}{4} \times \frac{5}{8} \times \frac{2}{3}$

Exercise 12. (*Written*)

Find the product in each of the following.

	1.	2.	3.	4.
a.	$\frac{9}{40} \times \frac{21}{32}$	$\frac{12}{41}$ of $\frac{15}{56}$	$\frac{56}{63} \times \frac{36}{49}$	$\frac{45}{56} \times \frac{35}{54} \times \frac{39}{64} \times \frac{24}{25}$
b.	$\frac{15}{42} \times \frac{27}{35}$	$\frac{27}{35}$ of $\frac{24}{31}$	$\frac{27}{56} \times \frac{64}{81}$	$\frac{27}{50} \times \frac{20}{63} \times 48 \times \frac{35}{24}$

Changing a Mixed Number to an Improper Fraction. When a mixed number is to be multiplied by a mixed number, it is sometimes desirable to change the mixed numbers to improper fractions before performing the multiplication.

To change a mixed number to an improper fraction, multiply the whole number by the denominator of the fraction, and to the *result add the numerator. Then write this sum over the denominator of the fraction.* Thus,

$$5\tfrac{3}{4} = \frac{(5 \times 4) + 3}{4} = \frac{20 + 3}{4} = \frac{23}{4}$$

Exercise 13. (Oral)

State the improper fraction that is equivalent to the mixed number in each of the following.

	1.	2.	3.	4.	5.	6.
a.	$1\frac{3}{4}$	$4\frac{2}{3}$	$12\frac{1}{2}$	$6\frac{7}{12}$	$4\frac{1}{15}$	$2\frac{15}{16}$
b.	$2\frac{6}{8}$	$3\frac{5}{6}$	$5\frac{7}{8}$	$3\frac{9}{16}$	$2\frac{11}{12}$	$10\frac{5}{8}$

Multiplication of a Mixed Number by a Mixed Number. Sometimes both the quantity purchased and the unit price are in the form of mixed numbers. The cost of the purchase is then found by multiplying the price, expressed as a mixed number, by the quantity expressed as a mixed number. Two methods of multiplying a mixed number by a mixed number are the following:

Method 1. Multiply separately the fraction and whole number in the multiplicand by the fraction and whole number in the multiplier, and add the results. This is often referred to as the *four-step method.*

Method 2. Change the mixed numbers to improper fractions and then multiply.

Example: $13\frac{5}{8} \times 9\frac{2}{3} = ?$

Solution

Method 1.

$13\frac{5}{8}$	
$9\frac{2}{3}$	*24ths*
$\frac{5}{12}$	*10 (Step 1)*
$8\frac{2}{3}$	*16 (Step 2)*
$5\frac{5}{8}$	*15 (Step 3)*
117	*(Step 4)*

$130 + \frac{41}{24} = 131\frac{17}{24}$ *Ans.*

Explanation

The multiplication is divided into four steps, as follows:

Step 1. Multiply the fractions. ($\frac{5}{8} \times \frac{2}{3} = \frac{5}{12}$)

Step 2. Multiply the whole number in the multiplicand by the fraction in the multiplier. ($13 \times \frac{2}{3} = 8\frac{2}{3}$)

Step 3. Multiply the fraction in the multiplicand by the whole number in the multiplier. ($\frac{5}{8} \times 9 = 5\frac{5}{8}$)

Step 4. Multiply the whole numbers. ($13 \times 9 = 117$). The answer is the sum of all the partial products.

Method 2. $13\frac{5}{8} \times 9\frac{2}{3} = \frac{109}{8} \times \frac{29}{3} = \frac{3{,}161}{24} = 131\frac{17}{24}$ *Ans.*

Exercise 14. (Written)

Find the product in each of the following by the four-step method.

	1.	2.	3.	4.	5.
a.	$22\frac{1}{3} \times 14\frac{2}{3}$	$44\frac{3}{4} \times 26\frac{1}{3}$	$34\frac{2}{3} \times 26\frac{1}{6}$	$31\frac{3}{8} \times 22\frac{2}{3}$	$32\frac{3}{4} \times 14\frac{7}{8}$
b.	$27\frac{2}{3} \times 16\frac{1}{4}$	$21\frac{2}{3} \times 19\frac{3}{4}$	$28\frac{5}{6} \times 15\frac{1}{3}$	$24\frac{5}{8} \times 16\frac{1}{2}$	$19\frac{1}{2} \times 15\frac{1}{3}$

Exercise 15. (Written)

In each of the following, change the mixed numbers to improper fractions and then multiply.

	1.	2.	3.	4.	5.
a.	$3\frac{1}{4} \times 2\frac{1}{2}$	$4\frac{1}{2} \times 2\frac{1}{4}$	$4\frac{1}{8} \times 3\frac{1}{2}$	$1\frac{1}{5} \times 2\frac{5}{8}$	$5\frac{1}{4} \times 2\frac{1}{3}$
b.	$2\frac{1}{4} \times 4\frac{1}{5}$	$3\frac{1}{5} \times 2\frac{1}{8}$	$6\frac{1}{3} \times 4\frac{1}{4}$	$3\frac{1}{5} \times 2\frac{1}{4}$	$2\frac{3}{4} \times 1\frac{2}{3}$

Problems for Application and Review

1. (a) Multiply 37 by $\frac{3}{8}$. (b) From $12\frac{1}{4}$, subtract $7\frac{1}{3}$. (c) Find the sum of $18\frac{2}{3}$ and $9\frac{3}{4}$. (d) Divide 126.67 by 5,300, to the nearest hundredth. (e) Find the cost of 39,000 lb. at $1.40 per cwt.

2. On March 31, Edgar Wade's checkbook balance was $198.27. Upon comparing his checkbook with the items on the bank statement, Mr. Wade discovered the following discrepancies: He had issued and the bank had paid a check for $10.87 that he had not recorded on the check stubs. A deposit of $18.76 had been entered twice in the record on the check stubs. The bank had deducted a service charge of $1.08 for maintaining the account. A check issued for $161.20 had been recorded and deducted on the check stub as $116.20. Find the correct checkbook balance.

3. A fruit dealer bought 5 crates of strawberries (24 quarts to the crate) at $6.70 a crate. If 15 quarts were unsalable, at what price per quart must he sell the remainder if he wishes to realize a gross profit of $8.50 on the entire transaction?

4. A clothier bought 150 suits for $3,450 and marked them to sell at $35.50 each. During the regular season, 100 suits were sold at this price. He decided to close out the remainder at a special clearance sale. To what price may he reduce the remaining suits and still realize a gross profit of $1,575 on the 150 suits?

5. A grocer buys canned goods at 85¢ a dozen cans and sells them at 3 cans for 28¢. At that rate, how many dozen cans must he buy and sell in order to realize a gross profit of $25.65?

Section 3 . . . Determining Unit Prices

Prices Quoted for Fractional Quantities. In many cases, the quoted price of an article is for a fractional quantity. The price of cookies or crackers, for example, may be the price for a $\frac{1}{2}$ or $\frac{3}{4}$ lb. box; the price of tea may be for a $\frac{1}{4}$ or $\frac{1}{2}$ lb. package; or the price of peanut butter may be for a 12 oz. ($\frac{3}{4}$ lb.) jar. In other cases the quoted price may be for a quantity that is expressed in the form of a mixed number. Thus, the price of chocolates or other candies is often the price for a $1\frac{1}{2}$ or $2\frac{1}{2}$ lb. box or jar.

When the quoted price is for a fractional quantity or a quantity expressed as a mixed number, you should be able, by division, to determine the equivalent price of one unit, such as one ounce, one pound, or one quart, etc., as the case may be. This should be done because your basis of comparison with related prices in the same store and of a similar article in other stores is usually the price of one unit.

Finding the Unit Price When the Quoted Price Is for a Fractional Quantity. We have seen in a preceding section that, when the quoted price is for two or more units, the buyer divides the price by the quantity to find the equivalent price of one unit. Thus, if you are offered 3 dozen oranges for $1.59, and you wish to find the equivalent price of one dozen, the solution would be:

Price of 3 dozen = $1.59
Price of 1 dozen = 159 ÷ 3 = $.53

The same principle applies when the quoted price is for a fractional part of a unit. To find the unit price, the buyer would divide the quoted price by the fraction representing the quantity.

Example: If the price of a cellophane package containing 10 oz. ($\frac{5}{8}$ lb.) of marshmallows is 23¢, what is the equivalent price of one pound.

Solution: *Price of $\frac{5}{8}$ lb. = 23¢*
Price of 1 lb. = $23 \div \frac{5}{8} = 36\frac{4}{5}$, or 37¢ Ans.

Explanation:

Since the cost of $\frac{5}{8}$ lb. is 23¢, the cost of 1 lb. is $23 \div \frac{5}{8}$. To divide 23 by the fraction, $\frac{5}{8}$, invert the fraction and then multiply. Thus,

$$23 \div \frac{5}{8} = 23 \times \frac{8}{5} = \frac{184}{5} = 36\frac{4}{5}¢, \text{ or } 37¢ \text{ Ans.}$$

Finding the Unit Price When the Quoted Price Is for a Quantity Expressed as a Mixed Number. If the quoted price is for a quantity expressed in the form of a mixed number, you would find the equivalent price of one unit by dividing the quoted price by the mixed number representing the quantity.

Example: If the price of a $1\frac{1}{2}$ lb. jar of hard candies is 93¢, what is the equivalent price per pound?

Solution: *Price of $1\frac{1}{2}$ lb. = 93¢*
Price of 1 lb. = 93¢ ÷ $1\frac{1}{2}$ = or 62¢ Ans.

Explanation:

Since the cost of $1\frac{1}{2}$ lb. is 93¢, the cost of 1 lb. is $93 \div 1\frac{1}{2}$. The division of 93 by the mixed number $1\frac{1}{2}$ may be carried out by changing the mixed number to the improper fraction, $\frac{3}{2}$, and then inverting this fraction and multiplying. Thus,

$93 \div 1\frac{1}{2} = 93 \div \frac{3}{2} = 93 \times \frac{2}{3} =$ 62¢. *Ans.*

Exercise 16. (Written)

1. At the King Food Store, the price of a $\frac{5}{8}$ lb. package of macaroon cookies is 24¢. This is equivalent to what price for one pound?

2. At Wood's Variety Store the price of chocolate caramels is 16¢ for $\frac{3}{16}$ lb. What is the equivalent price per pound?

3. At Ford's Candy Shop the price of a $2\frac{1}{2}$ lb. box of assorted candies is $2.75. What is the price per pound?

4. If the cost of a $6\frac{1}{2}$ oz. jar of salted pecans is 89¢, what is the cost per ounce?

5. At the Washington Market the price of a $\frac{9}{16}$ lb. package of pantry cookies is 21¢. At the Knickerbocker Food Store the price of a $1\frac{1}{4}$ lb. package of the same cookie is 40¢. (a) Which store is offering the cookies at the lower cost per pound? (b) How much lower?

COMMON FRACTIONS (Continued)

Division of a Whole Number by a Fraction. When the quoted price is for a fractional quantity and you wish to determine the equivalent price of a whole unit, it is necessary to divide the price, expressed as a whole number, by the quantity expressed as a fraction. The division applies the following rule:

To divide any number by a fraction, invert the fraction representing the divisor and then proceed as in multiplication. For example,

$$8 \div \frac{2}{3} = 8 \times \frac{3}{2} = \overset{4}{\cancel{8}} \times \frac{3}{\cancel{2}} = 12$$

Exercise 17. (Oral)

State the quotient in each of the following:

	1.	2.	3.	4.	5.	6.
a.	$1 \div \frac{1}{2}$	$12 \div \frac{1}{3}$	$28 \div \frac{4}{5}$	$1 \div \frac{3}{16}$	$2 \div \frac{8}{9}$	$6 \div \frac{4}{5}$
b.	$1 \div \frac{1}{3}$	$2 \div \frac{2}{3}$	$9 \div \frac{3}{8}$	$2 \div \frac{3}{4}$	$3 \div \frac{9}{10}$	$4 \div \frac{3}{5}$
c.	$8 \div \frac{1}{4}$	$5 \div \frac{5}{8}$	$1 \div \frac{3}{4}$	$3 \div \frac{4}{5}$	$4 \div \frac{6}{7}$	$6 \div \frac{9}{16}$

Exercise 18. (Written)

Find the quotient in each of the following:

	1.	2.	3.	4.	5.
a.	$23 \div \frac{2}{3}$	$12 \div \frac{5}{6}$	$14 \div \frac{5}{12}$	$15 \div \frac{7}{8}$	$16 \div \frac{7}{12}$
b.	$13 \div \frac{3}{4}$	$36 \div \frac{8}{9}$	$216 \div \frac{3}{4}$	$9 \div \frac{11}{12}$	$26 \div \frac{8}{15}$
c.	$16 \div \frac{6}{7}$	$7 \div \frac{3}{8}$	$5 \div \frac{3}{16}$	$27 \div \frac{15}{16}$	$17 \div \frac{15}{16}$

Division of a Fraction by a Fraction. There are three methods that may be used for the division of a fraction by a fraction.

Method 1. Invert the fraction representing the divisor and then proceed as in multiplication. For example,

$$\frac{4}{5} \div \frac{2}{3} = \frac{4}{5} \times \frac{3}{2} = \frac{\overset{2}{\cancel{4}}}{5} \times \frac{3}{\cancel{2}} = \frac{6}{5} = 1\frac{1}{5}$$

When the division is performed mentally, without the aid of written calculations, it is often more convenient to omit the cancellation of the common factor. Thus,

$$\frac{4}{5} \div \frac{2}{3} = \frac{4}{5} \times \frac{3}{2} = \frac{12}{10} = 1\frac{2}{10} = 1\frac{1}{5}$$

Method 2. When the denominators are the same, ignore the denominators, and divide the numerator of the fraction in the dividend by the numerator of the fraction in the divisor. To illustrate,

$$\frac{3}{7} \div \frac{4}{7} = 3 \div 4 = \frac{3}{4}$$

Just as 3 cents ÷ 4 cents = $\frac{3}{4}$, so 3 sevenths ÷ 4 sevenths = $\frac{3}{4}$

Method 3. Change the dividend and divisor to fractions having the same denominator, and then divide the numerator in the dividend by the numerator in the divisor.

$$\frac{5}{16} \div \frac{3}{4} = \frac{5}{16} \div \frac{12}{16} = 5 \div 12 = \frac{5}{12}$$

Method 3 is often used when the denominator of one of the fractions is the common denominator.

Exercise 19. (Oral)

State the quotient in each of the following. Perform the division by the method that is most appropriate.

	1.	2.	3.	4.	5.	6.
a.	$\frac{1}{3} \div \frac{1}{2}$	$\frac{2}{5} \div \frac{3}{5}$	$\frac{1}{6} \div \frac{2}{3}$	$\frac{1}{6} \div \frac{1}{8}$	$\frac{3}{4} \div \frac{15}{16}$	$\frac{3}{4} \div \frac{4}{5}$
b.	$\frac{1}{12} \div \frac{1}{3}$	$\frac{3}{8} \div \frac{5}{8}$	$\frac{1}{12} \div \frac{5}{6}$	$\frac{2}{3} \div \frac{4}{9}$	$\frac{2}{5} \div \frac{2}{3}$	$\frac{14}{15} \div \frac{4}{15}$
c.	$\frac{1}{3} \div \frac{1}{9}$	$\frac{3}{16} \div \frac{9}{16}$	$\frac{2}{9} \div \frac{2}{3}$	$\frac{5}{8} \div \frac{3}{8}$	$\frac{7}{8} \div \frac{1}{4}$	$\frac{3}{4} \div \frac{7}{12}$
d.	$\frac{3}{4} \div \frac{1}{12}$	$\frac{1}{3} \div \frac{1}{3}$	$\frac{8}{9} \div \frac{2}{3}$	$\frac{3}{4} \div \frac{1}{2}$	$\frac{4}{9} \div \frac{2}{3}$	$\frac{5}{6} \div \frac{5}{8}$

Division of a Fraction by a Whole Number. When a problem requires the division of a fraction by a whole number, either of the following methods of division may be used.

Method 1. Divide the numerator of the fraction by the whole number. This method is used when the numerator is a multiple of the whole number. To illustrate,

$$\frac{15}{16} \div 5 = \frac{15 \div 5}{16} = \frac{3}{16}$$

Method 2. Multiply the denominator of the fraction by the whole number. This method is used when the numerator of the fraction is not a multiple of the whole number. For example,

$$\frac{2}{3} \div 5 = \frac{2}{3 \times 5} = \frac{2}{15}$$

If the whole number and the numerator of the fraction contain a common factor, the common factor may be eliminated by cancellation before multiplying the denominator. Thus,

$$\frac{8}{9} \div 6 = \frac{8}{9 \times 6} = \frac{\overset{4}{\cancel{8}}}{9 \times \underset{3}{\cancel{6}}} = \frac{4}{27}$$

Exercise 20. (Oral)

State the quotient in each of the following:

	1.	2.	3.	4.	5.	6.
a.	$\frac{3}{3} \div 3$	$\frac{12}{25} \div 3$	$\frac{3}{4} \div 5$	$\frac{4}{5} \div 6$	$\frac{8}{8} \div 8$	$\frac{12}{15} \div 3$
b.	$\frac{4}{5} \div 4$	$\frac{1}{4} \div 5$	$\frac{2}{3} \div 8$	$\frac{5}{8} \div 5$	$\frac{2}{3} \div 9$	$\frac{3}{4} \div 9$
c.	$\frac{3}{4} \div 3$	$\frac{1}{3} \div 4$	$\frac{3}{8} \div 6$	$\frac{5}{16} \div 3$	$\frac{3}{4} \div 12$	$\frac{9}{10} \div 6$
d.	$\frac{8}{11} \div 4$	$\frac{2}{5} \div 3$	$\frac{6}{7} \div 4$	$\frac{3}{8} \div 4$	$\frac{1}{6} \div 4$	$\frac{8}{12} \div 4$

Division Involving Mixed Numbers. Sometimes, in determining unit prices, the quantity or the unit price, or both, may be a mixed number. The division in such cases may be performed by changing each mixed number to an improper fraction and then proceeding as in division with fractions. To illustrate:

$$5\tfrac{3}{4} \div 1\tfrac{1}{8} = \frac{23}{4} \div \frac{9}{8} = \frac{23}{4} \times \frac{8}{9} = \frac{23}{\cancel{4}} \times \frac{\overset{2}{\cancel{8}}}{9} = \frac{46}{9} = 5\tfrac{1}{9}$$

Exercise 21. (Written)

Find the quotient in each of the following.

	1.	2.	3.	4.	5.
a.	$12\frac{1}{2} \div 4\frac{1}{2}$	$17\frac{1}{4} \div \frac{3}{4}$	$483\frac{3}{8} \div 15$	$90 \div 6\frac{3}{4}$	$85 \div 4\frac{3}{8}$
b.	$37\frac{1}{2} \div 3\frac{1}{8}$	$41 \div 2\frac{2}{3}$	$516\frac{3}{4} \div 21$	$45\frac{3}{4} \div 22\frac{1}{2}$	$43\frac{1}{2} \div 5\frac{1}{4}$
c.	$4\frac{3}{8} \div 5$	$2\frac{3}{4} \div 11$	$69 \div 3\frac{3}{4}$	$7\frac{3}{4} \div \frac{5}{6}$	$239\frac{7}{8} \div 15\frac{5}{8}$

Problems for Application and Review

Group A

1. (a) Using the four-step process, multiply $32\frac{1}{2}$ by $18\frac{1}{4}$. (b) Subtract $12\frac{1}{4}$ from $15\frac{1}{6}$. (c) Find the sum of $8\frac{2}{3}$, $12\frac{1}{4}$, and $13\frac{5}{6}$. (d) .72 × what amount = $39.60? (e) Multiply 3,050 by 1,400. (f) Divide 67 by 3,100, correct to 3 decimal places.

2. On May 31, William Allen's bank balance was $1,232.15, and his checkbook balance was $663.96. Deposits of $138.70 and $206.25 were not recorded on the stub of the checkbook, while the following checks had not been presented for payment: $76.18, $17.06; $130. Reconcile the balances.

3. A dealer bought 100 dozen men's shirts at $19.50 a dozen and marked them to sell at $2.29 each. All were sold except 10 dozen that were soiled or of odd sizes. These were sold in a clearance sale at the special price of $1.15 each. Find the dealer's gross profit on the 100 dozen shirts.

4. A grocer purchased 3 crates of eggs (30 dozen eggs to the crate) from a poultry farmer at $15.60 a crate, and paid $1.96 express charges on the shipment. Upon opening the crates, he found that 24 eggs were broken and had to be thrown away. He sold 50 dozen of the salable eggs at 71¢ a dozen and the remainder at 65¢ a dozen. (a) Find the amount of his total gross profit on the purchase and sale of the three crates. (b) What was his average gross profit per dozen on the eggs he sold?

5. A haberdasher purchased men's shirts at $1.75 each and marked them to sell at $2.79. At that price he sold 64 shirts the first week. In order to increase sales, he reduced the price to $2.29. As a result, he sold 156 shirts the second week. (a) During which week did he make the larger amount of gross profit? (b) How much larger was his gross profit that week?

Group B

1. (a) Using the four-step method, multiply $25\frac{2}{5}$ by $15\frac{2}{3}$. (b) Find the sum of $16\frac{2}{3}$, $5\frac{3}{5}$, and $8\frac{1}{4}$. (c) From $102\frac{2}{3}$, subtract $69\frac{7}{8}$. (d) Multiply 600.97 by 8.796. (e) Divide 8.48232 by 3.1416.

2. A vegetable dealer bought 10 crates of lettuce at $5.20 a crate, each crate containing 60 heads. He was able to sell 264 heads at 15¢ each. Fifty-four heads spoiled and had to be thrown away. At what price did he have to sell each of the remaining heads in order that his gross profit on the entire transaction would be as near $13 as possible?

3. A clerk's sales for the first five days of the week were $187.50, $294.35, $361.20, $410.15, and $349.20, respectively. What must be the amount of his sales on the sixth day in order that his daily average for the six days may be $400?

4. A clothier buys men's hose at $3.70 a dozen pairs and sells them at 2 pairs for 95¢. At that rate, how many pairs will he have to buy and sell in order to realize a gross profit of $25?

5. A department store had been selling women's gloves at $3.25 a pair. In order to increase the number of sales, the price was reduced to $2.75. As a result, the sales increased from 6 pairs to 20 pairs a day. If the gloves cost the store $2.25 a pair, what was the store's increase in daily gross profit?

UNIT IV

PERSONAL FINANCE

Section 1 . . . Income from Wages

Income from Wages. The principal income of many people consists of the weekly wages they receive for their labors in the store, office, shop, or factory. A person should be able to compute his wages in order that he may verify the amount he receives.

Hour-Rate Wages. When an employee is paid on an hour-rate basis, he is paid a definite amount per hour for each hour he works. For example, if an employee works 40 hours during one week at the rate of $1.50 an hour, his earnings for the week are $60:

$$\$1.50 \times 40 = \$60$$

Regular Time and Overtime. The number of hours that constitute a regular day's work or week's work are referred to as *regular time* or *straight time.*

The time an employee is required to work in excess of the prescribed regular hours is referred to as *overtime.*

The wage rate per hour for overtime is usually one and one half times the regular rate. In such cases the company is said to pay time and a half for overtime. In some industries *double time* (two times the regular rate) is paid for work on Sundays and holidays.

Computing Overtime Wages and Total Wages. When time and a half is paid for overtime, the employee's overtime wages may be calculated in the following manner:

(*1*) Multiply the regular hourly rate by 1½ to find the overtime hourly rate.

(*2*) Multiply the overtime rate by the number of overtime hours.

The total wages is the sum of the regular-time wages and the overtime.

Example: The employees of the Winslow Chemical Company are paid weekly on the basis of a 40-hour week with time and a half for overtime. Find the total wages earned in one week by Henry Dunbar who worked 44 hours and whose regular wage rate is $1.50 an hour.

Solution

Overtime wages

44 − 40 = 4, overtime hours
$ 1.50 Regular rate
×1½
$2.25 Overtime rate
× 4
$9.00 Overtime wages

Regular-time wages

$1.50 × 40 = $60.00

Total wages

$60.00 Regular time
9.00 Overtime
$69.00 Total wages Ans.

Exercise 1. (*Written*)

1. Assuming that time and a half is paid for overtime, find the overtime rate for each of the following regular-time rates: (a) $1.54; (b) $1.82; (c) $1.55; (d) $1.66; (e) $1.62½; (f) $1.87.

2. The employees of the Central Foundry Company are paid weekly on the basis of a 40-hour week with time and a half for overtime. (a) Find the wages earned last week by Fred Nolan who worked 45 hours. His regular wage rate was $1.68 an hour. (b) Find the wages of Earl Durand who worked 44 hours at a regular wage rate of $1.87 an hour.

3. A factory is operating on a 40-hour week regular time with time and a half for overtime. Find the wages earned by J. E. Chase who worked 50 hours at a regular wage rate of $1.69 an hour and the wages earned by D. C. Logan who worked 52 hours at a regular wage rate of $1.75 an hour.

4. The regular factory hours of the Bedford Mills are eight hours a day for a five-day week (Monday through Friday) with time and a half for overtime each day. During one week Joseph Hurley worked as follows:

	Mon.	Tues.	Wed.	Thurs.	Fri.
Hours worked	8	9½	6	10	9

(a) If Hurley received $1.71 an hour as his regular wage, what was the amount of his regular wages for the week? (b) What was the amount of his total earnings?

5. In the factory of Ames & Rand, the working schedule for employees is 40 hours per week. Time and a half is paid for overtime. During the month of August, Walter Clark, a mechanic in the plant, worked 36 hours the first week, 40 hours the second, 47 hours the third, and 38 hours the fourth. His regular hour rate was $2.15. Find his average weekly earnings for the month of August.

Exercise 2. (*Written*)

1. During the week of October 23, Paul Adams, an electrician, earned $121.50, $\frac{1}{9}$ of which was overtime earnings. (a) What was the amount of his overtime earnings? (b) What was the amount of his regular-time earnings?

2. John Knapp, a stock clerk, left the employ of Barnet & Wilson, where he has been getting a regular wage rate of $1.16 an hour, and went to work for Bliss & Davis, who offered him $\frac{1}{8}$ more per hour than he had been getting with Barnet & Wilson. What hourly rate was he offered by Bliss & Davis?

3. Carl Lane's earnings for the first week of December were $73.80. For the second week they were $\frac{1}{12}$ less than for the first. What were his earnings for the second week?

4. For the week of September 30, Walter Seaver's total wages amounted to $76.50, of which $12.75 was for overtime. (a) What part of his total wages were his overtime earnings? (b) What part were his regular-time earnings?

5. Robert Mead, a tinsmith, earned $84 during the first week of December, $96 during the second week, and $88 during the third week. (a) His earnings the second week were what part more than his earnings the first week? (b) His earnings the third week were what part less than his earnings the second week?

COMMON FRACTIONS (*Continued*)

Types of Problems Involving Fractional Relationships. The problems in Exercise 2 on this page are examples of four general types of problems involving the fractional relationships of numbers. These four types of problems are:

1. To find a part of a number.
2. To find the number that is a certain part greater (or smaller) than a given number.
3. To find what part one number is of another number.
4. To find what part one number is greater (or smaller) than another number.

The method of solution for each of these four types of problems is explained and illustrated below.

To Find a Part of a Number. To find a part of a given number, multiply the number by the fraction representing the part.

Example: What number is $\frac{3}{4}$ of 24?

Solution

$\frac{3}{4} \times 24 = 18$ *Ans.*

Explanation

As explained on page 56, the expressions "$\frac{3}{4}$ of 24" and "$\frac{3}{4} \times 24$" are interchangeable; that is, "$\frac{3}{4}$ of 24" means the same as "$\frac{3}{4} \times 24$." Therefore $\frac{3}{4}$ of 24 may be found by multiplying 24 by $\frac{3}{4}$.

Other expressions that mean the same as $\frac{3}{4}$ times 24 are "$\frac{3}{4}$ *as much as* 24," "$\frac{3}{4}$ *as great as* 24," "$\frac{3}{4}$ *as large as* 24," and "$\frac{3}{4}$ *as many as* 24." In each case the result would be obtained by multiplying $\frac{3}{4}$ by 24.

Exercise 3. (*Oral*)

1. What number is $\frac{2}{3}$ of 21?
2. $\frac{4}{5} \times 25$ is what number?
3. $28 \times \frac{3}{4}$ equals what number?
4. $\frac{5}{6} \times 18 =$ what number?
5. How much is $\frac{6}{5}$ of \$20?
6. $\frac{5}{3} \times 12 =$ what number?
7. What amount $= \frac{7}{4} \times \$20$?
8. $\frac{4}{3} \times 24 =$ what number?
9. What number is $\frac{2}{3}$ as large as 27?
10. What amount is $\frac{7}{8}$ as much as \$32?
11. How many hours are $\frac{5}{6}$ as many as 42 hours?
12. What amount is $\frac{3}{8}$ as great as \$40?

To Find the Number That Is a Certain Part Greater (or Smaller) than a Given Number. An expression such as "$\frac{1}{4}$ greater than 24" or "$\frac{1}{4}$ more than 24" means $\frac{1}{4}$ of 24 added to 24. Thus, the number that is $\frac{1}{4}$ greater than 24 is 30.

$$24 + \tfrac{1}{4} \text{ of } 24 = 24 + 6 = 30$$

Similarly, an expression such as "$\frac{1}{4}$ smaller than 24" or "$\frac{1}{4}$ less than 24" means $\frac{1}{4}$ of 24 subtracted from 24. Thus, the number that is $\frac{1}{4}$ smaller than 24 is 18.

$$24 - \tfrac{1}{4} \text{ of } 24 = 24 - 6 = 18$$

Exercise 4. (*Oral*)

1. What amount is $\frac{1}{6}$ more than $18?
2. What amount is $\frac{1}{4}$ smaller than $48?
3. What number is $\frac{5}{8}$ greater than 32?
4. $\frac{5}{6}$ more than $30 is how much?
5. What amount is $\frac{3}{8}$ less than $40?
6. $\frac{2}{7}$ less than $28 is how much?
7. How much is $25 decreased by $\frac{2}{5}$ of itself?
8. $20 increased by $\frac{6}{5}$ of itself is how much?
9. $45 less $\frac{2}{9}$ of itself is what amount?

To Find What Part One Number Is of Another Number. To find what part one number is of another, express the relationship of the numbers in the form of a fraction whose numerator is the number representing the part and whose denominator represents the whole, or the number with which the part is compared. Reduce the resulting fraction to its lowest terms.

Example: 18 is what part of 24?

Solution	*Explanation*
$\frac{18}{24} = \frac{3}{4}$ *Ans.* *Proof* $\frac{3}{4}$ of $24 = 18$	18 is the number representing the part. 24 is the whole, or the number with which 18 is to be compared. Therefore the fraction $\frac{18}{24}$, or $\frac{3}{4}$, expresses what fractional part 18 is of 24.

When a number is compared with a number larger than itself, the result is less than 1 and is therefore a proper fraction. When it is compared with itself, the result is equal to 1. When it is compared with a number smaller than itself, the result is more than 1 and therefore an improper fraction. Thus,

24 is $\frac{4}{5}$ of 30 $(\frac{24}{30} = \frac{4}{5})$
24 is the whole of (1 ×) 24 $(\frac{24}{24} = 1)$
24 is $\frac{6}{5}$ of 20 $(\frac{24}{20} = \frac{6}{5})$

Exercise 5. (*Oral*)

1. 12 is what part of 18? 16? 15? 10? 8?
2. What part of 12 is 8? 10? 15? 16? 18?
3. 25 is what part of 35? 30? 20? 15?

To Find What Part One Number Is Greater (or Smaller) than Another Number. To find what part one number is greater (or smaller) than another number, first subtract the smaller from the larger to find the number representing the part. Then write this number as the numerator of a fraction whose denominator represents the number with which the part is to be compared. Reduce the resulting fraction to its lowest terms.

Example 1: 20 is what part greater than 16?

Solution

$20 - 16 = 4$

$\frac{4}{16} = \frac{1}{4}$ *Ans.*

Proof

$16 + (\frac{1}{4} \times 16) =$

$16 + 4 = 20$

Explanation

20 is 4 greater than 16. 4 is therefore the number representing the part. The expression "greater than 16" means that 16 is the whole, or the number with which the part, 4, is to be compared. Therefore the fraction $\frac{4}{16}$, or $\frac{1}{4}$, expresses the part of 16 by which 20 is greater than 16.

Example 2: 16 is what part smaller than 20?

Solution

$20 - 16 = 4$

$\frac{4}{20} = \frac{1}{5}$ *Ans.*

Proof

$20 - (\frac{1}{5} \times 20) =$

$20 - 4 = 16$

Explanation

16 is 4 smaller than 20. 4 is therefore the number representing the part. The expression "smaller than 20" means that 20 is the whole, or the number with which the part, 4, is to be compared. Therefore the fraction $\frac{4}{20}$, or $\frac{1}{5}$, expresses the part of 20 by which 16 is smaller than 20.

Exercise 6. (Oral)

1. 10 is what part greater than 8?
2. What part smaller than 15 is 12?
3. 20 is what part less than 28?
4. What part more than 12 is 20?
5. 14 equals 10 increased by what part of itself?
6. 15 decreased by what part of itself is 5?

Problems for Application and Review

Group A

1. (a) 90 is $4\frac{1}{2}$ times what number? (b) What number multiplied by $3\frac{1}{2}$ gives 84? (c) What number multiplied by $\frac{3}{8}$ gives 144?

2. A factory is working on a 40-hour week regular time, with time and a half for overtime. Find (a) the wages due Grady who worked 47 hours at $1.85 an hour and (b) the wages due Huff who worked 45 hours at $1.81 an hour.

3. A man was getting $1.80 an hour working an 8-hour day. How much must he get an hour to secure the same daily wage if the working day is reduced to $7\frac{1}{2}$ hours?

4. (a) A salary of $185 a month is equivalent to how much a year? (b) A salary of $2,550 a year is equivalent to how much a month? (c) $58 a week is equivalent to how much a year? (d) $2,730 a year is equivalent to how much a week?

5. A man works each weekday from 9:00 a.m. to 4:45 p.m., with one hour out for lunch, except on Saturday when he quits at 12 noon. What did he earn last week at $1.80 an hour if he worked full time except for $2\frac{1}{2}$ hours lost on Thursday?

Group B

1. (a) What number multiplied by $4\frac{1}{2}$ gives 144? (b) What number multiplied by $\frac{7}{16}$ gives 112? (c) Subtract $22\frac{2}{3}$ from $40\frac{3}{8}$.

2. A factory is working on a 40-hour week with time and a half for overtime. Find (a) the wages due Dugal who worked 48 hours at $1.69 an hour and (b) the wages due Barker who worked 47 hours at $1.73 an hour.

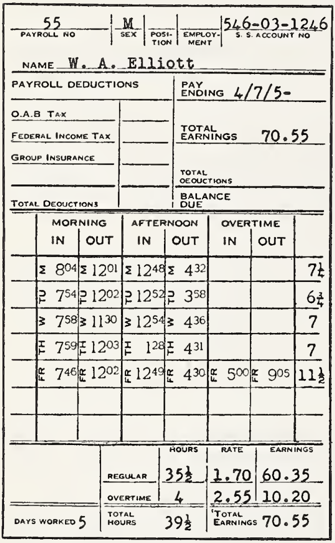
3. A man was getting $\$1.71\frac{1}{2}$ an hour working an 8-hour day. How much must he get an hour to assure the same wages if the working day is reduced to 7 hours?

4. (a) A salary of $260 a month is equivalent to how much a year? (b) How much a week?

5. A man works each weekday from 8:30 a.m. to 4:30 p.m., with one hour out for lunch, except on Saturday when he quits at 12 noon. What did he earn last week at $1.75 an hour if he worked full time except for $1\frac{1}{2}$ hours lost on Wednesday?

Section 2 . . . Income from Wages (Concluded)

Use of the Time Clock and Timecard. In firms that employ a large number of workers it is customary to use a time clock for recording the employees' time. Each employee is provided with a timecard, which is kept in a rack beside the clock. When the employee reports for work in the morning, he removes his card from the rack and inserts it in the clock. The clock stamps on the card the exact time of his arrival. The card is stamped in the same manner when he leaves at noon, comes to work in the afternoon, and leaves in the afternoon, and whenever he works overtime.



PAYROLL NO 55
SEX M
POSITION
EMPLOYMENT
S. S. ACCOUNT NO 546-03-1246

NAME W. A. Elliott

PAYROLL DEDUCTIONS
O.A.B TAX
FEDERAL INCOME TAX
GROUP INSURANCE
TOTAL DEDUCTIONS

PAY ENDING 4/7/5-
TOTAL EARNINGS 70.55
TOTAL DEDUCTIONS
BALANCE DUE

	MORNING		AFTERNOON		OVERTIME		
	IN	OUT	IN	OUT	IN	OUT	
	M 8^{04}	M 12^{01}	M 12^{48}	M 4^{32}			$7\frac{1}{4}$
	TU 7^{54}	TU 12^{02}	TU 12^{52}	TU 3^{58}			$6\frac{3}{4}$
	W 7^{58}	W 11^{30}	W 12^{54}	W 4^{36}			7
	TH 7^{59}	TH 12^{03}	TH 1^{28}	TH 4^{31}			7
	FR 7^{46}	FR 12^{02}	FR 12^{49}	FR 4^{30}	FR 5^{00}	FR 9^{05}	$11\frac{1}{2}$

		HOURS	RATE	EARNINGS
	REGULAR	$35\frac{1}{2}$	1.70	60.35
	OVERTIME	4	2.55	10.20
DAYS WORKED 5	TOTAL HOURS	$39\frac{1}{2}$	TOTAL EARNINGS	70.55

Timecard

The card in the accompanying illustration shows the arriving and leaving times of W. A. Elliott for each day of the week ending April 7.

The company for which Elliott works has a five-day week of $37\frac{1}{2}$ hours with daily hours from 8 a. m. to 12 noon and from 1 p. m. to 4:30 p. m. If he arrives late or leaves early, the time is recorded in heavy type. All other arriving and leaving times are recorded in light type.

Computing Wage Time and Earnings from the Timecard Record. In the timecard illustrated above, the figures in the column at the right of the card show the number of hours W. A. Elliott worked each day. They were recorded by the pay-roll clerk in the office of the company where Elliott is employed.

The number of hours worked each day is recorded in hours and quarter hours. Fractional parts less than one quarter of an hour (15 minutes) are not considered. If the employee arrives from 1 to 15 minutes late, he receives credit for $\frac{1}{4}$ hour less than a full day. If he arrives from 16 to 30 minutes late, he receives credit for ½ hour less time. The same principle applies when he leaves early. On the other hand, no credit is given for arriving early or departing late.

Thus, in the timecard of W. A. Elliott, on Monday, 8:04 was regarded as though it were 8:15; 12:01 as though it were 12:00; 12:48 as though it were 1:00; and 4:32 as though it were 4:30. Elliott was therefore credited with 7¼ hours for Monday.

On Tuesday, 7:54 was regarded as though it were 8:00; 12:02 as though it were 12:00; 12:52 as though it were 1:00; and 3:58 as though it were 3:45. He was therefore credited with 6¾ hours for Tuesday. And so on.

At the bottom of the card the pay-roll clerk recorded both the number of regular hours and the number of overtime hours. The regular hours were multiplied by the hourly wage rate and the overtime hours by a rate 1½ times the regular rate. The two resulting figures were added to find the total earnings, $70.55.

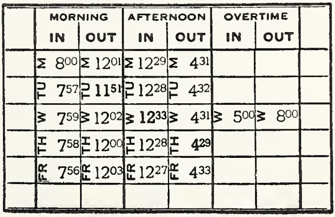
Exercise 7. (*Oral*)

Assuming that the regular factory hours are from 8 a. m. to 12 noon and from 1 p. m. to 5 p. m., and that fractional parts less than ¼ hour are not considered, state the number of hours indicated in each of the following:

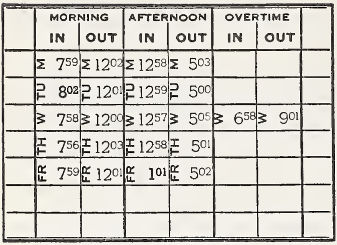
	In	Out		In	Out		In	Out
1.	7:59	12:01	**5.**	1:00	5:02	**9.**	9:10	12:01
2.	7:48	12:02	**6.**	12:58	4:03	**10.**	1:18	5:04
3.	7:50	11:50	**7.**	1:11	5:06	**11.**	8:10	11:40
4.	7:59	11:29	**8.**	12:54	3:33	**12.**	12:49	4:24

Exercise 8. (*Written*)

1. The illustration at the right shows the timecard entries of John Taylor, employee of the Maxwell Manufacturing Company, for the week ending December 7. His working day is from 8 a. m. to 12 noon and from 12:30 p. m. to 4:30 p. m. on the first 5 days of each week. His hourly wage is $1.52, and he is allowed time and a half for overtime. Find the amount of his total earnings for the week.



	MORNING		AFTERNOON		OVERTIME		
	IN	OUT	IN	OUT	IN	OUT	
	M 8^{00}	M 12^{01}	M 12^{29}	M 4^{31}			
	TU 7^{57}	TU 11^{51}	TU 12^{28}	TU 4^{32}			
	W 7^{59}	W 12^{02}	W 12^{33}	W 4^{31}	W 5^{00}	W 8^{00}	
	TH 7^{58}	TH 12^{00}	TH 12^{28}	TH 4^{29}			
	FR 7^{56}	FR 12^{03}	FR 12^{27}	FR 4^{33}			



	MORNING		AFTERNOON		OVERTIME		
	IN	OUT	IN	OUT	IN	OUT	
	M 7^{59}	M 12^{02}	M 12^{58}	M 5^{03}			
	TU 8^{02}	TU 12^{01}	TU 12^{59}	TU 5^{00}			
	W 7^{58}	W 12^{00}	W 12^{57}	W 5^{05}	W 6^{58}	W 9^{01}	
	TH 7^{56}	TH 12^{03}	TH 12^{58}	TH 5^{01}			
	FR 7^{59}	FR 12^{01}	FR 1^{01}	FR 5^{02}			

2. Bethel Rowe's working hours are from 8 a.m. to 12 noon and from 1 p.m. to 5 p.m. on the first 5 days of the week. His hourly wage is $1.84, and he is allowed time and a half for overtime. His timecard entries for the week ending April 15 are shown in the illustration at the left. Find the amount of his total earnings for the week.

Piece-Rate Wages. Instead of paying by the hour, some manufacturing concerns pay their employees according to the amount of work they do. When paid on this basis an employee receives a certain amount of money for each article or unit that he completes. These articles or units are termed *pieces,* and the employee is said to be working on a *piece-rate* basis. The number of pieces is multiplied by the rate per piece to find the employee's earnings.

Example: The Elco Brush Company operates on a piece-rate basis. In one of the departments of the factory the rate is 32¢ a piece. Nancy Ward, a worker in that department, completed the following number of pieces during the week of October 21: Mon. 36; Tues. 37; Wed. 38; Thurs. 40; Fri. 34. What was the amount of her total earnings for the week?

Solution

36 + 37 + 38 + 40 + 34 = 185, number of pieces
\$.32 × 185 = \$59.20, total earnings Ans.

The piece-rate system of paying wages is based upon the theory that the employee will work harder and more efficiently and will produce more than he would if paid by the day or hour. It has the advantage of rewarding the more efficient worker in proportion to his larger output.

Differential Piece-Rate Wages. In some firms that pay wages on a piece-rate basis, the rate per piece varies with the number of pieces the worker is able to produce in a given time, usually one day. Under this plan, which is called the *differential piecework* wage plan, the larger the number of pieces produced in one day, the higher the rate per piece. Thus, in the following schedule of piece-work rates of the Benson Electrical Manufacturing Company, it is seen that the worker who completes 25 pieces in one day receives a higher rate per piece than one who completes only 20 pieces.

SCHEDULE OF DIFFERENTIAL RATES

Pieces per Day	Rate per Piece	Pieces per Day	Rate per Piece
Up to 19	$39\frac{1}{2}$¢	29 – 31	$45\frac{1}{2}$¢
20 – 22	41¢	32 – 34	47¢
23 – 25	$42\frac{1}{2}$¢	35 – 37	$48\frac{1}{2}$¢
26 – 28	44¢	38 – 40	50¢

As a rule, when differential piece rates are used, each day's wages must be figured separately as the number of pieces a workman produces usually varies from one day to the next.

Exercise 9. (*Written*)

1. The production record of the Acme Tool Company shows that during one week Earl Kaler completed 34 pieces each day on Monday, Tuesday, and Wednesday; 32 pieces on Thursday; and 35 on Friday. If the company pays $65\frac{1}{2}$¢ for each piece, what was the total amount of Kaler's earnings for the week?

2. Irene Smith, a stitcher in the factory of the Stylecraft Shirt Company, is paid $2.25 for each dozen pieces completed. Her production record for the past week is as follows:

	Mon.	Tues.	Wed.	Thurs.	Fri.
Number of dozen	4	$4\frac{3}{12}$	$4\frac{4}{12}$	$3\frac{10}{12}$	$4\frac{4}{12}$

Find the amount of her total earnings for the week.

3. Using the schedule of differential rates shown above find the total wages earned in one week by Leo Shafer whose production record for the week is as follows:

	Mon.	Tues.	Wed.	Thurs.	Fri.
Pieces completed	23	27	30	36	33

Exercise 10. (*Written*)

1. Last week Henry Porth's overtime earnings amounted to $6.75, which was $\frac{1}{8}$ of his total earnings. (a) What was the amount of his total earnings for the week? (b) What was the amount of his regular-time earnings for the week?

2. Frank Quinn's total earnings during the second week in November amounted to $52.20, which was $\frac{1}{5}$ more than his earnings during the first week. What amount did he earn during the first week?

3. Fred Wenger's total earnings during the second week in November amounted to $54.60, which was $\frac{1}{6}$ less than his earnings during the first week. What amount did he earn during the first week?

COMMON FRACTIONS (*Concluded*)

Additional Types of Problems Involving Fractional Relationships. In the last section you worked with four general types of problems involving the fractional relationships of numbers. The problems in Exercise 10 beginning on page 81 are examples of two additional general types of problems in fractional relationships. These problems are:

5. To find the whole when a part is known.
6. To find the whole when an amount that is a part greater (or smaller) than the whole is known.

Important Principle of Fractional Relationships. A fraction expresses the comparison of one number with another. In the statement "60 is $\frac{2}{3}$ of 90," for example, the fraction $\frac{2}{3}$ expresses the comparison of 60 with 90. 90 is the number with which 60 is compared, or the number on which the comparison is based. This number is therefore referred to as the *base of the fraction*, or simply the *base*; and the fraction is said to be *based* on this number. Thus in the statement "60 is $\frac{2}{3}$ of 90," 90 is the *base*; and the fraction $\frac{2}{3}$ is *based* on 90.

In the statement "60 is $\frac{2}{3}$ of 90," the word "of" implies multiplication. That is, "$\frac{2}{3}$ of 90" indicates "$\frac{2}{3}$ *times* 90." Since 90 is the *base*, the number representing the base is multiplied by the fraction. The important principle you should observe is, *the number representing the base, and only the number representing the base, may be multiplied by the fraction.*

Since only the number representing the base may be multiplied by the fraction, you must select the base correctly to obtain the correct answer to a problem. The number representing the base is usually indicated by the number, expressed or implied, which follows immediately the expression indicating multiplication—such as "of," "as much as," "greater than," etc.

Thus in each of the following problems, 90 is the base, since the number 90 follows immediately the expression indicating multiplication. 90 may therefore be multiplied by the fraction.

What number is $\frac{2}{3}$ *as much as* 90?
$\frac{2}{3}$ *as much as* 90 is what number?
What number is $\frac{2}{3}$ *greater than* 90?
The number that is $\frac{2}{3}$ *smaller than* 90 is what?

On the other hand, in the problems given below, the *unknown number* is the base, because the term "what number" follows immediately the expression indicating multiplication. In these problems, the known number, 30, may *not* be multiplied by the fraction, because 30 does not represent the base.

30 is $\frac{2}{3}$ *as much as* what number?
$\frac{2}{3}$ *as much as* what number is equal to 30?
30 is $\frac{2}{3}$ *greater than* what number?

Problems like the three above cannot be solved by multiplying the known number by the fraction. The method of solving such problems is explained in the topic beginning at the bottom of this page and in the discussion on pages 84 and 85.

Exercise 11. (*Oral*)

In each of the following, state whether the whole number may or may not be multiplied by the fraction.

1. What number is $\frac{2}{3}$ as much as 30?
2. 36 is $\frac{3}{4}$ as much as what number?
3. 20 is $\frac{4}{5}$ of what number?
4. What amount is $\frac{3}{5}$ of \$30?
5. \$30 is $\frac{3}{5}$ of what amount?
6. $\frac{3}{4}$ of what amount = \$60?
7. $\frac{3}{4}$ of \$60 = what amount?
8. What number is $\frac{1}{4}$ greater than 40?
9. 40 is $\frac{1}{4}$ greater than what number?
10. $\frac{3}{4}$ of what number equals 48?

To Find the Whole When a Part Is Known. When the value of a fractional part of a number is known and it is desired to find the value of the whole, the problem is one of finding the number on which the given fraction is based. It is essentially a problem in finding the unknown factor when the other factor and the product are known.

Example: 36 is $\frac{3}{4}$ of what number?

Analysis: The problem tells us that if a certain unknown number is multiplied by $\frac{3}{4}$, the product is 36. Stated in the form of an equation:

$$\frac{3}{4} \times \text{the original number} = 36$$

It is at once evident that $\frac{3}{4}$ is one of the factors of 36. It is also evident that the other factor is represented by the original number, which is unknown. You have learned on page 35 that the unknown factor, or missing factor, can always be found by dividing the product by the known factor. In the foregoing problem the product is 36, and the known factor is $\frac{3}{4}$. Hence the unknown factor may be found by dividing 36 by $\frac{3}{4}$.

Solution: $\frac{3}{4} \times$ *the original number* $= 36$
The original number $= 36 \div \frac{3}{4} = 48$ *Ans.*

Proof: $\frac{3}{4} \times 48 = 36$

Exercise 12. (*Oral*)

1. 18 is $\frac{2}{3}$ of what number?
2. $\frac{4}{5}$ of what amount is \$20?
3. $\frac{3}{4}$ of 28 is what number?
4. What amount $\times \frac{3}{4} = \$24$?
5. $\frac{2}{3} \times \$21 =$ what amount?
6. $30 = \frac{6}{5}$ of what number?
7. \$36 is $\frac{3}{4}$ as much as what amount?
8. What amount is $\frac{3}{5}$ as much as \$15?
9. 24 is $\frac{2}{3}$ as large as what number?
10. What amount is $\frac{5}{4}$ of \$20?
11. 12 is $\frac{1}{3}$ of what number?
12. A number 4 times as large as 3 is $\frac{1}{2}$ as large as what number?
13. A number $\frac{1}{2}$ as large as 32 is $\frac{4}{5}$ of what number?
14. $\frac{5}{8}$ of what number is equal to $\frac{4}{5}$ of \$50?

To Find the Whole When an Amount That Is a Part Greater (or Smaller) than the Whole Is Known. An expression such as "32 is $\frac{1}{3}$ greater than another number" or "32 is $\frac{1}{3}$ more than another number" means that 32 is the result of *adding* $\frac{1}{3}$ of the unknown number to the unknown number.

Similarly, an expression such as "32 is $\frac{1}{3}$ smaller than another number" or "32 is $\frac{1}{3}$ less than another number" means that 32 is the result of *subtracting* $\frac{1}{3}$ of the unknown number from the unknown number.

In cases such as those mentioned above, the problem of finding the unknown number is one of finding the number on which the given fraction is based. This is essentially a problem in finding the unknown factor when the other factor and the product are known.

Example 1: What number increased by $\frac{1}{3}$ of itself equals 32?

Analysis: The problem tells us that if $\frac{1}{3}$ of a certain unknown number is added to that number, the sum is 32. Stated in the form of an equation:

The unknown number + $\frac{1}{3}$ of the unknown number = 32

(1) Since the increase is $\frac{1}{3}$ *of the unknown number*, it follows that the unknown number represents the base, or the whole, and that it is divided into *thirds*. The unknown number is therefore $\frac{3}{3}$ of itself.

(2) The increase is $\frac{1}{3}$ of the unknown number.

(3) The unknown number *plus* the increase is therefore $\frac{4}{3}$ of the unknown number. This sum, according to the problem, is equal to 32.

Solution:

$$\begin{aligned} \tfrac{3}{3} \times \textit{the number} &= \textit{the number} \\ + \tfrac{1}{3} \times \textit{the number} &= \underline{\textit{the increase}} \\ \tfrac{4}{3} \times \textit{the number} &= \textit{the number} + \textit{the increase} = 32 \\ \textit{The number} &= 32 \div \tfrac{4}{3} = 24 \quad \textit{Ans.} \end{aligned}$$

Proof: 24 + ($\frac{1}{3}$ of 24) = 24 + 8 = 32

Example 2: What number decreased by $\frac{1}{3}$ of itself equals 32?

Analysis: The problem tells us that if $\frac{1}{3}$ of a certain unknown number is subtracted from that number, the remainder is 32. Stated in the form of an equation:

The unknown number − $\frac{1}{3}$ of the unknown number = 32

Solution:

$$\begin{aligned} \tfrac{3}{3} \times \textit{the number} &= \textit{the number} \\ - \tfrac{1}{3} \times \textit{the number} &= \underline{\textit{the decrease}} \\ \tfrac{2}{3} \times \textit{the number} &= \textit{the number} - \textit{the decrease} = 32 \\ \textit{The number} &= 32 \div \tfrac{2}{3} = 48 \quad \textit{Ans.} \end{aligned}$$

Proof: 48 − ($\frac{1}{3}$ of 48) = 48 − 16 = 32

Exercise 13. (*Oral*)

1. 24 is $\frac{1}{3}$ larger than what number?
2. 36 is $\frac{1}{4}$ less than what number?
3. 40 is $\frac{1}{4}$ more than what number?
4. 45 is $\frac{2}{3}$ larger than what number?
5. 18 is $\frac{2}{3}$ less than what number?
6. $\frac{1}{6}$ less than what sum equals $60?
7. What amount increased by $\frac{3}{4}$ of itself equals $28?
8. 60 is equal to what number decreased by $\frac{1}{5}$ of itself?
9. A number 3 times as large as 4 is $\frac{1}{3}$ less than what number?
10. A number $\frac{1}{2}$ as large as 30 is $\frac{1}{4}$ more than what number?

Review of Problems Involving Fractional Relationships. In this section and the preceding section you have studied six different general types of problems involving fractional relationships. The two exercises that follow provide review practice in solving each of these types of problems.

Exercise 14. (*Oral*)

1. What number is $\frac{2}{3}$ as large as 12?
2. What number is $\frac{1}{4}$ more than 32?
3. 36 diminished by $\frac{1}{3}$ of itself equals what number?
4. 12 is what part of 15?
5. 24 is what part more than 20?
6. What part less than 36 is 30?
7. 36 is $\frac{3}{4}$ as large as what number?
8. 20 is $\frac{1}{4}$ larger than what number?
9. What number diminished by $\frac{1}{3}$ of itself equals 36?
10. 60 is $\frac{1}{3}$ less than what number?
11. 48 is $\frac{1}{3}$ larger than what number?
12. 36 is $\frac{3}{2}$ of what number?
13. What part more than 10 is 12?
14. 60 is $\frac{1}{4}$ less than what number?
15. A number 3 times as large as 6 is what part of 20?
16. 36 is $\frac{1}{2}$ larger than what number?
17. What part more than 12 is 16?
18. 40 is $\frac{1}{5}$ less than what number?
19. What number is $\frac{3}{4}$ larger than 36?
20. What number is $\frac{5}{3}$ of 15?
21. 60 is $\frac{1}{4}$ more than what number?
22. What number is $\frac{3}{4}$ smaller than 80?
23. 30 is $\frac{5}{3}$ of what number?
24. 40 is what part less than 44?
25. 28 is $\frac{3}{7}$ less than what number?

Exercise 15. (Written)

1. $1,250 is what part of $2,000?
2. What part of $35 is $10.50?
3. 50¢ is what part of $12.50?
4. $3.12 is $\frac{2}{3}$ of how much?
5. $16.50 is $\frac{3}{4}$ of how much?
6. $4.20 is $\frac{4}{7}$ of how much?
7. $3.85 is $\frac{2}{5}$ more than how much?
8. $9.90 is $\frac{2}{9}$ more than how much?
9. $1.68 is $\frac{3}{4}$ more than how much?
10. $40.50 is $\frac{1}{10}$ less than how much?
11. $3.20 is $\frac{3}{8}$ less than how much?
12. $2.04 is $\frac{1}{4}$ less than how much?
13. $36 is what part more than $28?
14. What part more than $3.60 is $4.95?
15. $3.25 is what part more than $2.50?
16. $20 is what part less than $22.50?
17. What part less than $68 is $54.40?
18. $12.75 is what part less than $15?
19. $\frac{1}{5}$ more than $15.50 is $\frac{2}{3}$ of what amount?
20. $\frac{1}{8}$ more than $44 is $\frac{3}{4}$ of what amount?
21. $\frac{1}{3}$ more than $60 is $\frac{1}{5}$ less than what amount?
22. $\frac{1}{3}$ more than $11.34 is $\frac{1}{10}$ less than what amount?

Problems for Application and Review

Group A

1. (a) What number multiplied by $\frac{5}{4}$ gives 160? (b) 196 increased by $\frac{1}{4}$ of itself equals what number? (c) What number divided by $4\frac{1}{4}$ gives 34? (d) 195 is $\frac{3}{5}$ of what number? (e) What number increased by $\frac{1}{4}$ of itself gives 220? (f) What number divided by $\frac{3}{8}$ equals 216? (g) Subtract $15\frac{3}{5}$ from $28\frac{1}{3}$.

2. The employees of the Canton Foundry are paid weekly on the basis of a 40-hour week with time and a half for overtime. During the month of April, Lester Rich worked 44 hours the first week, 37 hours the second, 46 hours the third, and 40 hours the fourth. His regular hour rate is $1.45 an hour. Find his total wages for the four weeks.

3. (a) A salary of $227.50 a month is equivalent to how much a year? (b) How much a week?

4. Benton receives an hourly wage of \$1.60 an hour for a 40-hour week and time and a half for overtime. During one week he works 10 hours daily, Monday through Friday, and 6 hours on Saturday. How much does Benton earn during this week?

5. The regular factory hours of the Jenkins Company are 8 hours a day for a 5-day week (Monday through Friday). Time and a half is paid for overtime each day. During one week Frank Gilman worked as follows: Monday, 8 hours; Tuesday, 9 hours; Wednesday, 6 hours; Thursday, $10\frac{1}{2}$ hours; Friday, 8 hours; Saturday, 4 hours. If Gilman received \$$1.87\frac{1}{2}$ as his regular hourly wage, what was the total amount of his earnings for the week?

Group B

1. (a) What number divided by $\frac{4}{5}$ equals 480? (b) 240 is $\frac{5}{6}$ of what number? (c) What number divided by $3\frac{1}{2}$ gives 35? (d) 288 is $\frac{9}{8}$ times what number? (e) What number increased by $\frac{1}{3}$ of itself gives 192? (f) What number is $\frac{1}{4}$ greater than 272? (g) Using the four-step process, multiply $42\frac{1}{7}$ by $78\frac{2}{3}$.

2. In the factory of Lane & Webster the working schedule for employees is 40 hours per week with time and a half for overtime. During the month of June, Albert Heim worked 40 hours the first week, 36 hours the second, 46 hours the third, and 39 hours the fourth. His regular hour rate is \$1.67. Find his average weekly wage for the four weeks.

3. Your employer has been paying you twice a month at the rate of \$214.50 a month. He now decides to change to a weekly pay roll. At the same rate, how much should you receive per week?

4. Carl Oliver receives an hourly wage of \$1.63 an hour for a 40-hour week with time and a half for overtime. During one week he works 9 hours daily, Monday through Friday, and 4 hours on Saturday. What were his total earnings for the week?

5. A factory pays time and a half for overtime each day. Regular factory hours are 8 hours a day, Monday through Friday. During the week of July 18, Ralph Gifford was employed as follows: Monday, 9 hours; Tuesday, 8 hours; Wednesday, $6\frac{1}{2}$ hours; Thursday, $9\frac{1}{2}$ hours; Friday, $8\frac{1}{2}$ hours. If Gifford's regular wage rate was \$1.70 an hour, what were his total earnings for the week?

6. During one month a farmer sold 40 dozen eggs at 50¢ a dozen, 60 dozen at 56¢ a dozen, 30 dozen at 48¢ a dozen, and 50 dozen at 52¢ a dozen. Find, to the nearest tenth of a cent, the average price he received per dozen.

Section 3 . . Personal Finance Records

Need for Personal Finance Records. If a person is to derive the most benefit and satisfaction from his income, he should keep a detailed record of his income and the purposes for which it is spent. Such records provide him a means of detecting needless or extravagant expenditures and waste. They show him where he may be able to avoid unnecessary expenses and spend more wisely. Also, they provide essential information that he will need if he wishes to budget or plan his future expenditures. Furthermore, if his total income for the year is such an amount that he is required by law to file a state or Federal income tax return, the records will supply the information needed for filling out the tax report.

Form of Income and Expenditures Record. There are several types of forms in which the record of income and expenditures may be kept. One that is in common use is given in the illustration on page 90, which shows the "Record of Income and Expenditures" kept by P. G. Hopkins and family. In this record Mr. Hopkins has recorded all transactions involving the receipt or payment of money.

Recording the Receipts and Payments. In the first two columns of the income and expenditures record, Mr. Hopkins has entered the date of each transaction.

In the next column, "Explanation," a brief explanation of each transaction is given.

All receipts are entered in the column headed "Receipts," and all payments are recorded in the column headed "Payments." The difference between the receipts and payments at any time should be the balance of cash on hand.

The amount of each expenditure is entered twice—first in the "Payments" column, and then in the column that shows the purpose of the payment. The distribution of the payments among the various columns is readily apparent in most cases. It will be observed that payments for taxes, furniture, and automobile expenses are entered in the "Miscellaneous" column.

The salary deduction for old-age benefit will be repaid to Mr. Hopkins in the form of a pension after he retires from active employment. It is in the nature of a saving and is therefore entered in the "Savings and Investment" column.

RECORD OF INCOME AND EXPENDITURES

DATE		EXPLANATION	RECEIPTS	PAYMENTS	ESSENTIALS			DEVELOPMENT			MISCELLANEOUS	SAVINGS AND INVESTMENT
					FOOD	CLOTHING	HOUSEHOLD	RECREATION	FAMILY WELFARE	CHARITY		
19— Feb	1	Balance	265 15									
	1	Salary	350 —	40 80							36 30	4 50
	1	Rent		75 —			75 —					
	3	10 gallons gasoline		2 90							2 90	
	5	Repairing garage door		1 65			1 65					
	7	Fuel, light, and water		19 55			19 55					
	8	National Grocery Co		21 —	21 —							
	8	Cleaning and pressing		2 25		2 25						
	22	School books		3 75					3 75			
	23	Monthly church donation		10 —						10 —		
	24	Tickets for concert		3 —				3 —				
	25	Gas Co. stock dividend	17 50									
	27	Living room chair		21 50							21 50	
	28	Monthly milk bill		10 50	10 50							
	28	S. Army and Red Cross		3 —						3 —		
			632 65 632 65	338 84 338 84	96 50 96 50	13 25 13 25	95 70 95 70	5 20 5 20	34 79 24 79	13 — 13 —	56 90 56 90	33 50 33 50
	28	Balance		293 81								
			632 65	632 65								
Mar	1	Balance	293 81									

Totaling and Balancing the Income and Expenditures Record. At the end of the month all columns in the income and expenditures record are totaled and ruled as shown in the illustration.

The balance of cash on hand at the end of the month is then added to the total of the "Payments" column to show that the sum of these two amounts is equal to the total of the "Receipts" column.

Finally, the balance on hand at the end of the month is entered in the "Receipts" column as the beginning entry for the new month.

Exercise 16. (*Written*)

1. On September 1 James Barnes, the head of a family, had a cash balance of $157.35. During the first week in September he performed the following transactions:

Sept. 1. Received salary for week ending August 30, $95, less deductions of $8.70 for withholding tax, and $1.43 for old-age benefit tax.
1. Paid $20 for week's rent.
2. Bought five gallons of gasoline, $1.45.
2. Paid $7.95 for groceries.
3. Paid $3.50 for tickets to a play.
4. Bought a pair of shoes, $10.95.
5. Paid $9.65 for groceries.
5. Bought five gallons of gasoline, $1.45.
6. Deposited $12.50 in savings account.
6. Paid $4.00 to have son's teeth cleaned.
7. Contributed $2.50 to church.

Enter the beginning balance and the transactions listed above in a record of personal income and expenditures like that shown in the illustration on page 90. Rule a form if a ruled form is not available. Rule and total the columns after recording transactions for the week and show the ending balance.

2. William Coats receives a monthly salary of $320. His expenditures last month were as follows:

Food	$96	Recreation and Family Welfare	$20
Household	80	Miscellaneous	16
Clothing	72	Savings	24
Benevolences	12		

(a) Find what decimal part of his income for the month was spent for each item. (b) Prove your answers in (a) by adding the results. The sum should be 1.

3. Last year, the G. M. Hilton family spent .32 of its income for food, .215 for rent, .16 for clothing, and .218 for other items. The remainder was saved. What decimal part of the income was saved?

4. The total income of A. K. Folsom for the month of September was $255. The amount saved was $25. Find to the *nearest thousandth* what decimal part of the income was saved.

5. Clifford Benzie, a householder, estimates that his total income for the coming year will amount to $4,870. He plans to apportion .26 of the income for food, .22 for rent, .14$\frac{3}{4}$ for development, .15$\frac{2}{3}$ for clothing, .12$\frac{1}{4}$ for miscellaneous items, and .09$\frac{1}{3}$ for savings. Find the amount, in dollars and cents, that he will allot for each expenditure.

6. Charles Knight, a single man, has a quarterly income of $1,000. He plans to spend .47$\frac{3}{4}$ of his income for board and room, .12$\frac{1}{2}$ for clothing, .11 for recreation and personal welfare, .06$\frac{1}{4}$ for charity, .14 for miscellaneous items, and .08$\frac{1}{2}$ for savings. Find the amount, in dollars and cents, that he plans to spend for each type of expenditure.

DECIMAL FRACTIONS

Expressing Common Fractions and Decimal Fractions. The preceding problems dealt with amounts expressed in dollars and cents. One dollar consists of, or is divided into, 100 cents. Therefore, any number of cents is so many hundredths of a dollar. Thus, $.59 is $\frac{59}{100}$ of a dollar, or \$$\frac{59}{100}$. Both $\frac{59}{100}$ and .59 are fractions.

A fraction such as $\frac{59}{100}$ is called a *common fraction.* A fraction such as .59 is called a *decimal fraction.*

A decimal fraction is a special way of writing a common fraction whose denominator is 10, 100, or 1,000, etc. In the decimal form, the denominator of the fraction is not written, but is indicated by a decimal point placed at the left of the numerator of the common fraction. The location of the decimal point is determined by dividing the numerator of the common fraction by the denominator. Thus, the common fraction, $\frac{7}{10}$, is written in decimal form as .7, since 7 ÷ 10 = .7. Similarly:

$\frac{1}{10}$ is written as the decimal fraction, .1
$\frac{1}{100}$ is written as the decimal fraction, .01
$\frac{27}{100}$ is written as the decimal fraction, .27
$\frac{27}{1,000}$ is written as the decimal fraction, .027

Exercise 17. (Mental)

Write each of the following in the form of a decimal fraction:

	1.	2.	3.	4.	5.	6.	7.
a.	$\frac{47}{100}$	$\frac{7}{10}$	$\frac{54}{100}$	$\frac{149}{10{,}000}$	$\frac{1}{100}$	$\frac{1}{10{,}000}$	$\frac{15}{1{,}000}$
b.	$\frac{137}{1{,}000}$	$\frac{83}{1{,}000}$	$\frac{1}{10}$	$\frac{7}{1{,}000}$	$\frac{9}{1{,}000}$	$\frac{4}{100}$	$\frac{6}{1{,}000}$

Kinds of Decimals. Decimal fractions are of three general kinds — simple or pure decimals, mixed decimals, and complex decimals.

A *simple decimal,* or *pure decimal,* is one that has a whole number at the right of the decimal point. Thus, \$.18, .45, and .307 are simple decimals.

A *mixed decimal* is one that consists of a whole number and a decimal fraction. Thus, \$4.55 and 23.4 are mixed decimals.

A *complex decimal* is one that has a whole number and a fraction at the right of the decimal point. Thus, $\$.08\frac{3}{4}$, $\$1.12\frac{1}{2}$, $.16\frac{2}{3}$, and $3.2\frac{1}{4}$ are complex decimals.

Converting a Common Fraction into a Decimal Fraction. When you have to find what decimal part one number is of another, as you did in Problems 2 and 4 on pages 91 and 92, the usual procedure is to express the relationship of the two numbers in the form of a common fraction, and then convert the fraction into its decimal equivalent. Since a common fraction indicates the division of the numerator by the denominator, the decimal equivalent of any common fraction can be obtained by carrying out the indicated division.

Example: Change $\frac{3}{8}$ to its equivalent decimal form.

Solution	*Explanation*
.375 Ans. *8)3.000*	The numerator, 3, is divided by the denominator, 8, until there is no remainder.

In most cases the division is not exact; that is, there will always be a remainder, no matter how far the quotient is extended. In such cases it is necessary to specify the number of places in the quotient, as shown in the example at the top of page 94.

Example: Change $\frac{3}{7}$ to a decimal of four places of exact value.

Solution

$$7\overline{)3.0000}\quad .4285\tfrac{5}{7}\ \textit{Ans.}$$

Explanation

The division is carried to 4 decimal places. Since the *exact* decimal equivalent is required, the remainder, 5, is retained and is written in the common-fraction form, $\frac{5}{7}$. The exact decimal equivalent is therefore .4285 $\frac{5}{7}$.

Example: Find the decimal equivalent of $\frac{3}{7}$ to 3 decimal places.

Solution

$$7\overline{)3.0000}\quad .4285$$

Ans. .429

Explanation

The quotient is carried to 4 decimal places and is then rounded at the third decimal place.

Exercise 18. (*Written*)

1. Change each of the following fractions to a decimal of *two places* of *exact* value: (a) $\frac{7}{9}$; (b) $\frac{6}{11}$; (c) $\frac{7}{12}$; (d) $\frac{5}{13}$; (e) $\frac{11}{14}$.

2. Find the decimal equivalent of each of the following fractions to *three* decimal places: (a) $\frac{6}{7}$; (b) $\frac{8}{9}$; (c) $\frac{11}{12}$; (d) $\frac{8}{11}$; (e) $\frac{3}{14}$.

3. Find the decimal equivalent of each of the following fractions to the nearest hundredth: (a) $\frac{4}{9}$; (b) $\frac{5}{12}$; (c) $\frac{4}{13}$; (d) $\frac{7}{11}$; (e) $\frac{9}{14}$.

Multiplication by .1, .01, and .001. As explained on page 19, when numbers containing decimals are multiplied, the decimal point is placed in the product by pointing off to the left as many decimal places as there are decimal places in the multiplicand and multiplier.

Hence, when the multiplier is .1, .01, or .001, and so on, the multiplication may be performed by moving the decimal point to the *left* in the multiplicand as many places as there are decimal places in the multiplier, prefixing ciphers if necessary. Thus,

.04 × .1 = .004 $8.50 × .1 = $ .85
64.5 × .01 = .645 $ 164 × .01 = $1.64
35 × .001 = .035 $2,450 × .001 = $2.45

Exercise 19. (*Mental*)

In each of the following, perform the multiplication mentally by the method explained above. Write the product only.

	1.	2.	3.	4.
a.	3.67 × .1	87.5 × .001	6.2 × .001	$251 × .01
b.	2.9 × .01	2.4 × .1	8 × .01	$840 × .001
c.	343 × .001	25 × .001	.64 × .1	$19.50 × .1
d.	.45 × .01	450 × .1	20 × .001	$3,650 × .01

Division by .1, .01, and .001. As explained on page 34, when numbers containing decimals are divided, the decimal point in both the dividend and divisor is moved to the right as many places as are required to make the divisor a whole number.

Hence, when the divisor is .1, .01, or .001, and so on, the division may be performed by moving the decimal point to the *right* in the dividend as many places as there are decimal places in the divisor, annexing ciphers if necessary. Thus,

645 ÷ .1 = 6,450 $14.16 ÷ .1 = $141.60
.0275 ÷ .01 = 2.75 $8.50 ÷ .01 = $850
9.3 ÷ .001 = 9,300 $15.25 ÷ .001 = $15,250

Exercise 20. (*Mental*)

In each of the following problems perform the division mentally by the method explained above. Write the quotient only.

	1.	2.	3.	4.
a.	1.7 ÷ .1	.0042 ÷ .001	.9 ÷ .01	$2.35 ÷ .001
b.	.36 ÷ .01	42 ÷ .01	.3 ÷ .001	$5.00 ÷ .1
c.	.208 ÷ .001	2.45 ÷ .001	1.75 ÷ .1	$ .27 ÷ .01
d.	.09 ÷ .01	8.3 ÷ .001	.1 ÷ .01	$1.65 ÷ .001

Converting a Decimal into a Common Fraction. A decimal may be converted into a common fraction by omitting the decimal point and writing the number as the numerator of a common fraction with a denominator of 10, 100, or 1,000, etc., as the case may be. The resulting common fraction should be reduced to lowest terms. To illustrate:

$$.75 = \frac{75}{100} = \frac{3}{4} \qquad .125 = \frac{125}{1{,}000} = \frac{1}{8} \qquad 1.4 = \frac{14}{10} = \frac{7}{5}$$

If the common fraction is a complex fraction,* multiply the numerator and denominator by the denominator of the common fraction in the numerator. Then reduce the resulting simple fraction to lowest terms. Thus,

$$.14\tfrac{2}{3} = \frac{14\frac{2}{3}}{100} = \frac{14\frac{2}{3} \times 3}{100 \times 3} = \frac{44}{300} = \frac{11}{75}$$

Exercise 21. (*Written*)

Change each of the following decimals to its equivalent common fraction in lowest terms.

	1.	2.	3.	4.	5.	6.	7.
a.	.17	.28	.095	.1875	$.03\frac{3}{4}$	$.26\frac{2}{3}$	$.033\frac{1}{3}$
b.	.95	.025	.052	.0175	$.01\frac{2}{3}$	$.93\frac{1}{3}$	$.583\frac{1}{3}$

Problems for Application and Review

Group A

1. (a) Express .12 as a common fraction. (b) What number divided by $\frac{3}{4}$ gives 336? (c) Express $.03\frac{1}{3}$ as a common fraction. (d) What number is $\frac{1}{4}$ smaller than 312? (e) Express $4.87\frac{1}{2}$ as a mixed number. (f) 276 is $\frac{4}{3}$ of what number?

2. Find the wages due S. N. Ross who in one week works 40 hours regular time and 8 hours overtime, if he receives $1.77 an hour for regular time and time and a half for overtime.

3. A man was getting $1.80 an hour for working an 8-hour day. How much must he get an hour to secure the same wages if the working day is reduced to $7\frac{1}{2}$ hours?

4. A man works each weekday from 9:00 a.m. to 4:45 p.m., with 30 minutes out for lunch, except on Saturday when he quits at 11:45 a.m. How much did he earn last week at $1.65 an hour if he worked full time except for 2 hours lost on Monday?

5. John Fay is working in a factory where his regular time is 8 hours a day for 5 days a week, Monday through Friday, with time and a half for all overtime. His regular wage is $1.35 an hour. Last week he worked 9 hours each day, Monday through Saturday. What were his total earnings for the week?

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*A *complex fraction* is one whose numerator or denominator, or both, is a fraction or a mixed number. Thus the fraction $\frac{14\frac{2}{3}}{100}$, for example, is a complex fraction.

Group B

1. (a) $\frac{7}{6}$ times what number gives 252? (b) Express .012 as a common fraction. (c) What number is $\frac{3}{8}$ smaller than 216? (d) Express $4.16\frac{2}{3}$ as a mixed number. (e) 192 is $\frac{3}{8}$ of what number? (f) Express $.02\frac{1}{2}$ as a common fraction.

2. The employees of Rice & Company are paid on the basis of a 40-hour week with time and a half for overtime. During the month of December, Martin worked 26 hours the first week, 44 hours the second, 43 hours the third, and 34 hours the fourth. His regular hour rate is $1.55. Find Martin's average weekly wage for the month of December.

3. A stenographer whose monthly pay has been $195 is now to be paid weekly. At the same rate, how much should she receive each week?

4. A worker is paid a regular wage of $1.70 an hour for 8 hours a day from Monday through Friday, with time and a half for all overtime. During one week he worked $8\frac{1}{2}$ hours each day, Monday through Saturday. What were his total earnings for the week?

5. Paul Rice, a factory hand who works on a piece-rate basis, completes 45 pieces on Monday, 48 on Tuesday, 55 on Wednesday, and 53 on Thursday. If he is paid 35¢ for each piece, how many pieces must he complete on Friday in order that his earnings for the five days may average $17.50 a day?

Group C

1. (a) What number divided by $1\frac{3}{4}$ gives 56? (b) Express $.13\frac{1}{3}$ as a common fraction. (c) $5\frac{1}{2}$ times what number equals 154? (d) Express $.07\frac{1}{2}$ as a common fraction. (e) 36 is $\frac{4}{3}$ of what number? (f) Divide 39.6 by 22,000.

2. A factory operates on a 40-hour week regular time, with time and a half for overtime. Find (a) the wages of Adams, who worked 36 hours at $$1.42\frac{1}{2}$ an hour, and (b) the wages of Bain, who worked 45 hours at $1.58 an hour.

3. A man was getting $$1.39\frac{1}{2}$ an hour working a 40-hour week. How much must he get an hour to secure the same wage if the working week is reduced to 36 hours?

4. The regular factory hours of the Spencer Machine Company are 7 hours a day from Monday through Friday, with time and a half for overtime each day. During the week of May 10, Sam Hoff was employed as follows: Monday, 8 hours; Tuesday, 7 hours; Wednesday, $5\frac{1}{2}$ hours; Thursday, $8\frac{1}{2}$ hours; Friday, $7\frac{1}{2}$ hours. If Hoff's regular wage rate was $1.60 an hour, what was the amount of his wages for the week?

Section 4 . . . Personal Budgets

Meaning and Purpose of Budgeting. Budgeting simply means estimating income in advance and planning expenditures so as to use this income wisely. It is one of the important steps in the wise management of personal finances.

The chart below pictures the distribution of family income in one of our major cities. It is based on an income of $400 a month. In preparing a budget, an individual or family usually must make provision for each type of expenditure shown on this chart.

Total Income 100%					
Food	Household	Clothing	Recreation & Family Welfare	Benevolences	Savings
25%	31%	$16\frac{2}{3}$%	10%	$6\frac{1}{3}$%	11%

Exercise 22. (*Written*)

1. Henry Frick, a single man, receives a salary of $105 a week. Of this amount he plans to save $45. What per cent of his weekly salary does he plan to save?

2. R. J. Rolston has a monthly income of $300. His budget allowances for June are as follows:

Savings	$ 30.00	Family Welfare	$15.00	Charity	$ 9.00
Household	100.00	Clothing	36.00	Recreation	20.00
		Food	90.00		

(a) What per cent of the monthly income was budgeted for each item? (b) Prove your answers in (a) by adding the results. The sum should be 100%.

3. The estimated income of the Robert West family for the current year is $4,000. The budget allowances for the year are as follows:

Food	$1,280	Household	$1,380	Other Items	$425
Clothing	650	Savings	265		

(a) What per cent of the income, to the nearest *tenth* per cent, is budgeted for each item? (b) Prove your answers in (a) by adding the results. The sum should be 100%.

4. The Samuel Parker family has an income of \$390 a month that is apportioned according to the chart on page 98. (a) What monthly amount is allowed for each classification? (b) Prove your answers in (a) by adding the results. The sum should be \$390.

PERCENTAGE

General Use of Per Cents. In the chart on page 98, the relationship of each type of expense to total family income is expressed as a per cent. For example, the chart shows that 25 per cent, or 25%, of the family income is appropriated for food. The portion appropriated for food could be expressed in the form of a decimal or a common fraction by saying it is .25 of the income or $\frac{1}{4}$ of the income. In most business and personal business affairs, however, the relationship between two numbers is more commonly expressed in terms of a per cent.

"Per Cent" Means "Hundredths." When we say that the portion of family income appropriated for food is 25 per cent, we mean that it is 25 hundredths, or .25, of the income. Hence,

.25 = 25 hundredths = 25 per cent, or 25%

Changing a Decimal or a Whole Number to a Per Cent. To change a decimal or a whole number to a per cent, *move the decimal point two places to the right and annex a per cent sign.* Thus,

$.25 = 25\%$ $.16\frac{3}{4} = 16\frac{3}{4}\%$ $2 = 200\%$
$.006 = .6\%$ $1.75 = 175\%$ $.3 = 30\%$

Exercise 23. (Oral)

Express each of the following as a per cent.

	1.	2.	3.	4.	5.	6.
a.	.37	.7	.124	$.16\frac{2}{3}$	2.61	4.06
b.	.05	.1	.036	$.38\frac{3}{4}$	1.14	1
c.	.01	.3	.0045	$2.37\frac{1}{2}$	1.00	3

N.B.

Changing a Common Fraction to a Per Cent. To change a common fraction to a per cent, first change the fraction to its decimal form by dividing the numerator by the denominator; then change that result to a per cent by moving the decimal point two places to the right and annexing a per cent sign. Thus,

$$\tfrac{3}{14} = 3 \div 14 = .21\tfrac{3}{7} = 21\tfrac{3}{7}\%$$

In changing a common fraction to a per cent, the fraction is usually changed to a two-place decimal of *exact* value, as indicated above, except in cases where the denominator of the fraction at the end of the decimal is a large number. In such cases the decimal may be carried to a predetermined number of decimal places of *approximate* value, as shown by the example below.

Example: Express $\frac{1}{13}$ as a per cent, to the nearest *tenth* per cent.

Solution	*Explanation*
$.076\frac{12}{13} = .077$ $13\overline{)1.000}$ *Ans.* 7.7%	Dividing 1 by 13 to three decimal places gives .076, with a remainder of $\frac{12}{13}$. Since $\frac{12}{13}$ is greater than $\frac{1}{2}$, the quotient is rounded to .077.

Therefore, $\frac{1}{13} = .077 = 7.7\%$, to the nearest *tenth* per cent.

Exercise 24. (*Written*)

1. Find the per cent that is equivalent to each of the following fractions: (a) $\frac{11}{15}$; (b) $\frac{13}{16}$; (c) $\frac{5}{18}$; (d) $\frac{4}{35}$; (e) $\frac{9}{32}$.

2. Find to the nearest *tenth* per cent the per cent that is equivalent to each of the following fractions: (a) $\frac{13}{15}$; (b) $\frac{11}{16}$; (c) $\frac{13}{18}$; (d) $\frac{9}{35}$; (e) $\frac{29}{32}$.

To Find What Per Cent One Number Is of Another. In Problem 1 on page 98 you were required to find what per cent \$45 is of \$105. To find what per cent one number is of another, divide the one by the other and then express the quotient as a per cent.

Example: 7 is what per cent of 24?

Solution	*Explanation*
$.29\frac{1}{6} = 29\frac{1}{6}\%$, $24\overline{)7.00}$ *Ans.*	7 represents the part, and 24 represents the whole with which the part is to be compared. Therefore the fraction $\frac{7}{24}$ expresses the fractional relationship of 7 to 24. Dividing 7 by 24 gives $.29\frac{1}{6}$, which equals $29\frac{1}{6}\%$.

Proof: $29\frac{1}{6}\%$ of $24 = .29\frac{1}{6} \times 24 = 7$

Before dividing, the fraction expressing the fractional relationship of the numbers should be reduced to lowest terms if this will make the division easier. Thus, to find what per cent 45 is of 105 the solution would be:

$$\frac{45}{105} = \frac{3}{7} = 3 \div 7 = .42\frac{6}{7} = 42\frac{6}{7}\%$$

Any Number Is 100% of Itself. The fact that any number is 100% of itself may be readily demonstrated by solving the problem, "25 is what per cent of 25?" Since the fraction $\frac{25}{25}$ expresses the fractional relationship of 25 to 25,

$$\frac{25}{25} = 25 \div 25 = 1 = 100\%$$

In like manner it may be shown that any other number, regardless of what that number may be, is 100% of itself. This is true, because when any number is divided by itself, the quotient is always 1; and the per cent equivalent to 1 is 100%.

When a number is compared with a larger number than itself, the result is *less than* 100%. When it is compared with itself, the result is *equal to* 100%. When it is compared with a smaller number than itself, the result is *more than* 100%. Thus,

$$\begin{aligned} &24 \text{ is } 80\% \text{ of } 30, \text{ since } \frac{24}{30} = \frac{4}{5} = 80\% \\ &24 \text{ is } 100\% \text{ of } 24, \text{ since } \frac{24}{24} = 1 = 100\% \\ &24 \text{ is } 120\% \text{ of } 20, \text{ since } \frac{24}{20} = \frac{6}{5} = 120\% \end{aligned}$$

Exercise 25. (*Oral*)

1. 9 is what per cent of 36?
2. What per cent of 28 is 14?
3. 20 is what per cent of 30?
4. 20 is what per cent of 20?
5. 20 is what per cent of 10?
6. 20 is what per cent of 5?
7. 20 is what per cent of 2?
8. What per cent of $45 is $15?
9. What per cent of $40 is $30?
10. What per cent of $30 is $40?
11. $15 is what per cent of $15?
12. 20 is what per cent of 120?
13. What per cent of 9 is 18?
14. $42 is what per cent of $600?
15. What per cent of $25 is $250?
16. $24 is what per cent of $800?
17. 33 is what per cent of 400?
18. What per cent of $12 is $18?
19. $20 is what per cent of $400?
20. What per cent of $500 is $26?

Exercise 26. (*Written*)

1. What per cent of 175 is 35?
2. $9.60 is what per cent of $120?
3. What per cent of $3.75 is $15?
4. $8 is what per cent of $125?
5. 413 is what per cent of 11,800?
6. $88 is what per cent of $2,400?
7. What per cent of 16 is $5\frac{1}{3}$?
8. What per cent of $150 is $8?
9. $22.50 is what per cent of $180?
10. What per cent of $7.50 is $45?

Changing a Per Cent to a Decimal. When you have to find a per cent of a number, it is often necessary to change the per cent to a decimal before performing the multiplication. For example, in Problem 4 on page 99, before multiplying $390 by 31%, you had to change 31% to the decimal form, .31.

You have learned on page 99 that a decimal may be changed to a per cent by moving the decimal point two places to the right and annexing a per cent sign. Thus, .187 = 18.7%.

By reversing the foregoing operation, a per cent may be changed to a decimal. Hence, to change a per cent to a decimal, *move the decimal point two places to the left in the per cent and drop the per cent sign.* To illustrate:

$18.7\% = .187$ $\quad 16\frac{3}{4}\% = .16\frac{3}{4}$ or $.1675$ $\quad 100\% = 1$

$1\frac{2}{3}\% = .01\frac{2}{3}$ $\quad \frac{3}{4}\% = .00\frac{3}{4}$ or $.0075$ $\quad 135\% = 1.35$

$\frac{2}{3}\% = .00\frac{2}{3}$ $\quad 6\frac{7}{8}\% = .06\frac{7}{8}$ or $.06875$ $\quad 200\% = 2$

Exercise 27. (Mental)

For each of the following per cents write the equivalent decimal or whole number, as the case may be.

	1.	**2.**	**3.**	**4.**	**5.**	**6.**	**7.**
a.	25%	4.6%	100%	$112\frac{1}{2}\%$	32.75%	$162\frac{1}{2}\%$	63%
b.	$18\frac{1}{2}\%$	.1%	125%	$116\frac{2}{3}\%$	2,000%	375%	$133\frac{1}{3}\%$
c.	$2\frac{3}{8}\%$	$\frac{2}{3}\%$	45.68%	.4%	130%	$\frac{1}{3}\%$	200%
d.	150%	$\frac{1}{4}\%$	1,000%	$1\frac{2}{3}\%$	$\frac{3}{4}\%$	1.7%	$41\frac{2}{3}\%$

To Find a Per Cent of a Number. In Problem 4 on page 99 you had to find 31% of $390 in order to obtain the amount that the Samuel Parker family budgeted for household expenses. Since "per cent" means "hundredths," the expression "per cent of" means "hundredths of," or "hundredths times." Hence, to find a per cent of a number, multiply the number by the decimal equivalent of the per cent. Thus,

$$31\% \text{ of } \$390 = .31 \times \$390 = \$120.90$$

When the result is to be obtained mentally, without the aid of intermediate written calculations, it is usually more convenient to multiply by the number in the per cent and then point off in the product. For example, in finding 9% of 205, write the product of 9 × 205, which is 1,845, and then point off two places, giving 18.45.

Exercise 28. (*Mental*)

In each of the following, perform the indicated multiplication mentally, without the aid of written calculations. Write the answer only.

	1.	2.	3.	4.
a.	12% of \$50	100% of \$160	300% of \$310	400% of \$208
b.	45% of \$60	4% of \$1,015	103% of \$400	12.6% of \$200
c.	2% of \$306	8.1% of \$300	20% of \$63	120% of \$70
d.	15.2% of \$400	200% of \$415	6% of \$325	3.5% of \$500
e.	30% of \$84	37% of \$600	40% of \$306	20% of \$109
f.	6% of \$3,000	12% of \$4,000	104% of \$2,000	4.2% of \$2,000

Multiplication by Aliquot Parts of 100%. When the multiplier is an aliquot part of 100%, the multiplication can usually be shortened considerably by using the fractional equivalent of the per cent. In Problem 4 on page 99, for example, you had to find $16\frac{2}{3}\%$ of \$390 in order to obtain the amount that the Samuel Parker family budgeted for clothing. Since the fractional equivalent of $16\frac{2}{3}\%$ is $\frac{1}{6}$, the product can be found more quickly by multiplying \$390 by $\frac{1}{6}$ than by $.16\frac{2}{3}$. Thus,

$$16\frac{2}{3}\% \text{ of } \$390 = \frac{1}{6} \text{ of } \$390 = \$65.00$$

The fractional equivalents of some of the more frequently used per cents are given below. These per cents and their fractional equivalents should be committed to memory so that they may be recognized instantly.

$50\% = \frac{1}{2}$
$25\% = \frac{1}{4}$
$75\% = \frac{3}{4}$

$20\% = \frac{1}{5}$
$40\% = \frac{2}{5}$
$60\% = \frac{3}{5}$
$80\% = \frac{4}{5}$

$12\frac{1}{2}\% = \frac{1}{8}$
$37\frac{1}{2}\% = \frac{3}{8}$
$62\frac{1}{2}\% = \frac{5}{8}$
$87\frac{1}{2}\% = \frac{7}{8}$

$33\frac{1}{3}\% = \frac{1}{3}$
$66\frac{2}{3}\% = \frac{2}{3}$
$16\frac{2}{3}\% = \frac{1}{6}$
$83\frac{1}{3}\% = \frac{5}{6}$

$14\frac{2}{7}\% = \frac{1}{7}$
$11\frac{1}{9}\% = \frac{1}{9}$
$8\frac{1}{3}\% = \frac{1}{12}$
$6\frac{2}{3}\% = \frac{1}{15}$
$6\frac{1}{4}\% = \frac{1}{16}$

Exercise 29. (*Oral*)

Using the fractional equivalent of the per cent, find:

1. 50% of \$42; of \$15; of \$49.
2. 25% of \$32; of \$28; of \$22.
3. 75% of \$24; of \$48; of \$28.
4. $12\frac{1}{2}\%$ of \$32; of \$72; of \$60.
5. 20% of \$15; of \$75; of \$65.
6. $37\frac{1}{2}\%$ of \$40; of \$88; of \$64.
7. 40% of \$35; of \$25; of \$55.
8. $62\frac{1}{2}\%$ of \$72; of \$48; of \$96.
9. 60% of \$45; of \$35; of \$55.
10. $87\frac{1}{2}\%$ of \$56; of \$32; of \$48.
11. 80% of \$25; of \$45; of \$35.
12. $33\frac{1}{3}\%$ of \$39; of \$27; of \$40.
13. $66\frac{2}{3}\%$ of \$27; of \$66; of \$45.
14. $16\frac{2}{3}\%$ of \$54; of \$42; of \$78.
15. $83\frac{1}{3}\%$ of \$24; of \$66; of \$54.
16. $14\frac{2}{7}\%$ of \$56; of \$42; of \$84.
17. $11\frac{1}{9}\%$ of \$54; of \$72; of \$45.
18. $8\frac{1}{3}\%$ of \$96; of \$36; of \$84.
19. $6\frac{2}{3}\%$ of \$45; of \$90; of \$75.
20. $6\frac{1}{4}\%$ of \$64; of \$80; of \$48.

Exercise 30. (Written)

Find the result of the multiplication indicated in each of the following problems. Use the fractional equivalent of the per cent wherever this will make the solution easier. Express each result to the nearest cent.

	1.	2.	3.
a.	27% of \$315	$133\frac{1}{3}\%$ of \$27.33	132% of \$85
b.	15.2% of \$208	106% of \$307	4.25% of \$44
c.	$13\frac{1}{3}\%$ of \$141	.25% of \$3,400	$3\frac{1}{3}\%$ of \$690
d.	$1\frac{1}{4}\%$ of \$680	$.06\frac{1}{4}\%$ of \$2,700	$16\frac{2}{3}\%$ of \$3,363
e.	25% of \$76.55	$10\frac{3}{4}\%$ of \$1,280	$166\frac{2}{3}\%$ of \$49.50
f.	$33\frac{1}{3}\%$ of \$14.19	$66\frac{2}{3}\%$ of \$14.50	$2\frac{2}{5}\%$ of \$65
g.	125% of \$848	$66\frac{1}{3}\%$ of \$1,098	165% of \$2,600

Changing a Per Cent to a Common Fraction. A per cent may be changed to a common fraction by two different methods.

Method 1. Change the per cent to a decimal and then change the decimal to a common fraction in its lowest terms. For example:

$$4.5\% = .045 = \frac{45}{1{,}000} = \frac{9}{200} \qquad .6\% = .006 = \frac{6}{1{,}000} = \frac{3}{500}$$

Method 2. Drop the per cent sign and write the number as the numerator of a common fraction with the denominator 100. Then reduce the fraction to lowest terms. To illustrate:

$$8\% = \frac{8}{100} = \frac{2}{25} \qquad 140\% = \frac{140}{100} = \frac{14}{10} = \frac{7}{5}$$

If the common fraction is a complex fraction, multiply the numerator and denominator by the denominator of the fraction in the numerator. Then reduce the resulting simple fraction to lowest terms. To illustrate:

$$4\tfrac{1}{2}\% = \frac{4\frac{1}{2}}{100} = \frac{4\frac{1}{2}\times 2}{100\times 2} = \frac{9}{200} \qquad \tfrac{2}{3}\% = \frac{\frac{2}{3}}{100} = \frac{\frac{2}{3}\times 3}{100\times 3} = \frac{2}{300} = \frac{1}{150}$$

Exercise 31. (Mental)

Express each of the following per cents as a common fraction in its lowest terms or as a mixed number, as the case may be.

	1.	2.	3.	4.	5.	6.	7.	8.
a.	3%	16%	.1%	.4%	2.4%	60%	8%	220%
b.	17%	5%	1.3%	1.2%	2.5%	$112\frac{1}{2}\%$	22.3%	30%
c.	2%	35%	15.7%	.5%	125%	15%	$133\frac{1}{3}\%$	3.5%
d.	14%	10%	.2%	1.5%	350%	.3%	19%	2.5%
e.	4%	40%	1.4%	.8%	6%	275%	1.8%	110%

Exercise 32. (*Written*)

Express each of the following per cents as a common fraction in its lowest terms.

1. $1\frac{1}{4}\%$
2. $1\frac{1}{2}\%$
3. $22\frac{1}{2}\%$
4. $13\frac{1}{3}\%$
5. $18\frac{2}{3}\%$
6. $3\frac{1}{8}\%$
7. $5\frac{5}{6}\%$
8. 1.25%
9. 22.5%
10. 18.4%

Problems for Application and Review

Group A

1. (a) Express .0125 as a per cent. (b) Express 45.69% as a decimal. (c) Express 6% as a common fraction. (d) 216 is what part greater than 180? (e) 180 is $\frac{4}{9}$ of what number? (f) What number decreased by $\frac{1}{4}$ of itself gives 396?

2. (a) A salary of $45 a week is equivalent to how much a year? (b) How much a month?

3. An office clerk works each weekday from 8:30 a.m. to 4:45 p.m., with one hour out for lunch, except on Saturday when she quits at 12:15 p.m. How much did she earn last week at $1.10 an hour if she worked full time except for $3\frac{1}{2}$ hours lost on Wednesday?

4. A farmer sold $\frac{3}{8}$ of his potato crop for $60. At that rate, what would he receive for the remainder of the crop?

5. A clerk saves 15% of his salary. If he earns $300 a month, in how many years can he pay for a house and lot costing $8,100?

6. James Henderson's income was $3,300 a year. He spent $264 for clothing, $924 for room and board, $396 for automobile expenses, and $363 for incidental expenses. What per cent of his income did he save?

Group B

1. (a) Express .0025 as a per cent. (b) Express 135% in decimal form. (c) Express 1.2% as a common fraction. (d) 144 increased by what part of itself gives 198? (e) 186 is $\frac{3}{2}$ of what number? (f) 240 is $\frac{1}{6}$ smaller than what number?

2. (a) A salary of $64.50 a week is equivalent to how much a year? (b) How much a month?

3. A worker is paid a regular wage of $1.40 an hour for a 38-hour week and time and a half for overtime. During one week he works 8 hours daily, Monday through Friday, and 5 hours on Saturday. Find his total wages for the week.

4. The Bradley family decided to take a trip abroad. Mrs. Bradley paid $1,125 for clothing for the family and found she had spent $\frac{3}{16}$ of her money. The cost of the clothing was only $\frac{3}{8}$ of the estimated cost of the trip. (a) How much did she have originally? (b) What was the estimated cost of the trip?

5. A man's income is $300 a month. His family expenses each month are as follows: rent, $75; gas and electricity, $9.50; telephone, $5.50; food, $33\frac{1}{3}\%$ of his income. Clothing and incidental expenses amount to $770 a year. How much is he able to save annually?

Group C

1. (a) Express 1.025 as a per cent. (b) What decimal is equivalent to 2.5%? (c) Express .8% as a common fraction. (d) 450 is $\frac{1}{5}$ greater than what number? (e) 360 is $\frac{5}{4}$ of what number? (f) 228 decreased by what part of itself gives 152?

2. Jones receives a salary of $75 a week and Smith a salary of $318.50 a month. (a) Which one receives the larger salary, and how much larger per week? (b) How much larger per month?

3. A farmer sold $\frac{3}{5}$ of his corn crop for $975. At that rate, what would he receive for the remainder of the crop?

4. A man's income is $300 a month. His expenses each month are as follows: rent, $70; gas, $4.25; electricity, $3.75; telephone, $3.50; food, 25% of his income. Certain other expenses total $600 a year. (a) Taking into consideration all of the foregoing expenses, what is his average monthly expense? (b) How much can he save in a year?

5. On June 1, James Whitney received his bank statement, which showed a bank balance of $1,032.53. His checkbook balance on that date was $744.18. The following checks were outstanding: $82.50; $20.75; $145.35. Whitney discovered that a canceled check for $35.85 was not recorded in the checkbook and that he had also failed to enter in his checkbook a deposit of $75.60. Prepare a reconciliation statement.

Section 5 . . . Income from Commissions

Commission on Sales. In many lines of business, a salesman is paid on a commission basis; that is, instead of being paid a fixed salary, he is paid in proportion to the value or quantity of the goods that he sells.

Straight Commission. Commission on sales may be in the form of a certain uniform amount for each article sold or it may be a certain uniform per cent of the salesman's total sales. When a salesman's entire earnings are in this form, he is said to be paid a *straight commission.*

To Find Amount of the Commission When Rate of Commission Is Based on Quantity Sold. When the rate of commission is expressed as a certain amount for each article, the number of articles that the salesman sells is multiplied by the rate per article to find the amount of the commission. Hence the formula,

Rate of Commission × Quantity Sold = Commission

Example: Roy Gates, a high school boy, sells magazines in his spare time and receives a straight commission of 6¢ on each magazine that he sells. During the first week of October he sells 115 magazines. What is the amount of his commission?

Solution: *$.06 × 115 = $6.90, commission*

To Find Amount of the Commission When Rate of Commission Is Based on Value of Sales. When the rate of commission is expressed as a per cent, the per cent is always based on the amount, or value, of the sales. Since the amount of sales is the base, this amount is multiplied by the per cent, or the rate of commission, to find the amount of the salesman's commission.

Rate of Commission × Sales = Commission

Example: James Black, a traveling salesman, receives a straight commission of 8% on his sales. During September his sales amount to $9,000. What is the amount of his commission?

Solution: *.08 × $9,000 = $720, commission*

Exercise 33. (*Oral*)

What is the amount of the commission in each of the following?

Quantity	Commission on each	Sales	Rate of Commission
1. 150 magazines	7¢	6. $2,000	5%
2. 160 tables	25¢	7. $7,000	2%
3. 215 books	40¢	8. $2,400	12½%
4. 34 radios	$5.00	9. $1,260	16⅔%
5. 24 units	$7.50	10. $1,500	8%

Salary and Commission. In some cases instead of a straight commission a salesman may receive a combination salary and commission. In other words, he may receive a stated salary plus a per cent of sales, or a stated salary plus a per cent of sales above a specified amount known as the salesman's quota. The exact method of compensation depends upon the firm by which the salesman is employed.

The commission may be paid on the salesman's total sales, or it may be paid on only the amount in excess of a specified quota. The commission encourages the salesperson to put forth his best efforts.

Example: Janet Booth, a saleslady in the Rand Department Store, is paid $35.00 per week, plus 5% on sales in excess of $600. Last week her sales amounted to $900. What were her total earnings for the week?

Solution: Stated salary = $35.00
Commission = 15.00 (5% of $300)
Total earnings $50.00

Exercise 34. (*Written*)

1. Albert Timmers, a real estate salesman for the Heldervale Development Company, sold 5 building lots at $675 each, 9 at $850 each, and 7 at $1,075 each. If his commission rate was 4¾%, what was his total commission?

2. Anna Taylor, a saleslady in the Tremont Department Store, receives a salary of $38 a week and a commission of 1% on all sales. Her sales during one week were $827.42. (a) How much commission did she earn that week? (b) What were her total earnings for the week?

3. Hugh Dyer, a salesman for the Wing Novelty Company, is employed on a salary-plus-commission basis, receiving 10% on sales above his quota. His monthly salary is $250, and his quota is $3,000 a month. (a) If his total sales last month amounted to $6,241.50, how much commission did he earn for the month? (b) What were his total earnings for the month?

4. Laura Clark, a salesgirl at Sherry's, receives a weekly salary of $37.50, plus a commission of $\frac{3}{4}$% on all sales. During the first week of December her sales amounted to $880. What were her total earnings for the week?

5. Ralph Rogers, a salesman for the E. J. White Company, receives a straight commission of $4\frac{1}{4}$% on all sales. His total sales for the month of September were $10,000. What was the amount of his commission for the month?

PERCENTAGE (*Continued*)

To Find 1%, 10%, 100%, or 1,000% of a Number. In Problem 2 on page 108 you had to find 1% of $827.42 in order to obtain the amount of the commission. Also, in Problem 3 you had to find 10% of $3,241.50. In other types of problems involving percentage you will be required to find 100% or 1,000% of a number.

The decimal or whole number equivalents of 1%, 10%, 100%, and 1,000% are as follows:

1% = .01 100% = 1
10% = .1 1,000% = 10

Hence, to find 1%, 10%, 100%, or 1,000% of a number, perform the multiplication by moving the decimal point in the number in accordance with the principles of multiplication by .01, .1, 1, or 10, as the case may be. Thus,

	To Find	Multiply	By Moving the Decimal Point	Answer
(a)	1% of 125	125 × .01	2 places to the *left*	1.25
(b)	10% of 125	125 × .1	1 place to the *left*	12.5
(c)	100% of 125	125 × 1	no places	125
(d)	1,000% of 125	125 × 10	1 place to the *right*	1,250

The multiplication should be performed mentally, without the aid of written calculations. Only the product, or answer, should be written.

Exercise 35. (*Mental*)

In each of the following, perform the indicated multiplication mentally. Write the answer only. In cases where the answer contains a fraction of a cent, give the result to the nearest cent.

	1.	2.	3.	4.
a.	1% of $40	10% of $34	1% of $26.50	100% of $5.30
b.	10% of $82	1% of $76	10% of $1.62	1% of $2.63
c.	100% of $39	1,000% of $.24	1% of $35.40	10% of $18.15
d.	1,000% of $32	10% of $112	1,000% of $1.10	100% of $7.50

Fractional Parts of 1%. Commission rates are sometimes expressed as fractions of a per cent, such as $\frac{1}{4}\%$, $\frac{1}{2}\%$, $\frac{2}{3}\%$, etc. Thus, in Problem 4 on page 109 the commission rate is $\frac{3}{4}\%$, and you had to find $\frac{3}{4}\%$ of $880 in order to obtain the commission.

A per cent such as $\frac{3}{4}\%$ means "$\frac{3}{4}$ of 1%"; and $\frac{3}{4}\%$ of $880 means "$\frac{3}{4}$ of 1% of $880." To find $\frac{3}{4}\%$ of $880, you may first find 1% of $880 and then take $\frac{3}{4}$ of the result; or you may first find $\frac{3}{4}$ of $880 and then take 1% of that result.

Example: $\frac{3}{4}\%$ of $880 = ?

Solution 1	*Solution 2*
1% of $880 = $8.80	$\frac{3}{4}$ of $880 = $660
$\frac{3}{4}$ of $8.80 = $6.60	1% of $660 = $6.60

A fraction of a per cent may be expressed in decimal form by first changing the common fraction to a decimal fraction and then changing the resulting per cent to a decimal. For example,

$$\frac{3}{4}\% = .75\% = .0075$$

If the common fraction in the per cent does not have a pure decimal equivalent, the per cent may be expressed in decimal form by dropping the per cent sign and then prefixing two ciphers and a decimal point. Thus,

$$\frac{2}{3}\% = .00\frac{2}{3}$$

Exercise 36. (*Oral*)

1. How much is $\frac{1}{4}\%$ of $1,200? of $2,440? of $760? of $2,600?
2. How much is $\frac{1}{2}\%$ of $430? of $540? of $148.50? of $86.90?
3. How much is $\frac{1}{8}\%$ of $2,400? of $3,600? of $4,200? of $3,000?
4. How much is $\frac{1}{10}\%$ of $2,000? of $4,150? of $155? of $100?

Exercise 37. (*Mental*)

In each of the following problems perform the indicated multiplication mentally. Write only the product.

	1.	2.	3.	4.
a.	25% of $1,600	½% of $2,800	¾% of $200	⅖% of $20
b.	¼ of $1,600	⅓% of $600	⅔% of $450	¾% of $64
c.	¼% of $1,600	⅛% of $640	⅜% of $96	⅔% of $60
d.	½ of $2,800	⅕% of $500	½% of $16	¼% of $920

Exercise 38. (*Mental*)

Express each of the following as a decimal:

	1.	2.	3.	4.	5.	6.
a.	¼%	½ of 1%	¾%	⅜ of 1%	⅓%	⅞%
b.	½%	⅕ of 1%	⅛%	⅖ of 1%	⅚%	⅔%

Exercise 39. (*Mental*)

Express each of the following as a per cent. In each case, express the fractional part of 1% in the form of a common fraction. For example, the answer to 1-a should be expressed as ¾%.

	1.	2.	3.	4.	5.
a.	.0075	.055	.00⅓	.00375	.0875
b.	.0325	.005	.00125	.0033⅓	.00875
c.	.0025	.002	.004	.00⅔	.0066⅔

Problems for Application and Review

Group A

1. (a) What per cent is equivalent to 2.135? (b) Express ¼ of 1% as a decimal. (c) What common fraction is equivalent to 2.5%? (d) 28 is what per cent of 112? (e) 204 is ¾ of what number? (f) 126 is ⅙ greater than what number? (g) What number decreased by ⅖ of itself gives 450? (h) Find ⅓% of $355.

2. A salesman is paid $45 a week and 2% commission on all sales. If his sales for one week amount to $937, what is his total income for the week?

3. A sales girl receives a weekly salary of $40 plus a commission of 5% on all sales in excess of $600 a week. During two consecutive weeks her total sales were $575 and $682, respectively. What were her total earnings for the two weeks?

4. White's salary is $396.50 a month. Black's is $88.50 a week. (a) Which one's salary is the greater, and how much greater per month? (b) How much greater per week?

5. While a certain make of shoes was selling at $6.50 a pair, a store sold an average of 42 pairs a day. By reducing the price to $5.85 a pair, the store increased its sales to 76 pairs a day. The shoes cost the store $4.50 a pair. (a) Was the amount of the daily gross profit increased or decreased by reducing the price? (b) How much was the increase or decrease?

Group B

1. (a) Find ¾% of $1,340. (b) 60 is what per cent of 24? (c) What number is ⅔ greater than 162? (d) 325 is what part greater than 250? (e) Express .015 as a common fraction. (f) Express ½% as a decimal. (g) Express .25% as a common fraction. (h) $330 is ⅔ of what amount?

2. A salesman is paid a salary of $350 a month and 1½% commission on all sales. If his sales for the month of December amounted to $8,260, what was his total income for the month?

3. Clayton Roth accepted a position as salesman at a monthly salary of $240 with 8% commission on all sales over $3,000 a month. Roth's sales in May amounted to $2,850, in June, $4,250, and in July $4,375. (a) What was Roth's total income for the three months? (b) What was his average monthly income?

4. Which salary offer is the better and how much better per month, an offer of $45 a week or an offer of $190 a month?

5. The Community Electric Appliance Company purchased washing machines at $105.50 each. At a selling price of $164.95, the company sold 15 machines a month. In order to increase the number of sales, the company reduced the selling price to $137.95, whereupon the sales increased to 25 machines a month. (a) At which selling price did the company make the larger monthly gross profit? (b) How much larger was the profit?

Section 6 . . . Graduated Commissions

Graduated Commissions. In some instances a salesman may receive a graduated commission. Under this plan the rate of commission varies with the quantity, quality, price range, or the total value of the goods sold.

Example: William Kennedy sells card tables. He receives a weekly commission of 75¢ each on sales of the first 50 tables, 95¢ each on sales of the next 20 tables, and $1.15 each on sales of additional tables. Last week he sold 75 tables. What was his commission?

$$\begin{array}{lrcrcr} \textit{Solution:} & \$\ .75 & \times & 50 & = & \$37.50 \\ & \$\ .95 & \times & 20 & = & 19.00 \\ & \$1.15 & \times & \underline{5} & = & \underline{5.75} \\ & & & 75 & & \$62.25,\ \textit{commission} \end{array}$$

Exercise 40. (*Written*)

1. Gerald Farmer, vacuum cleaner salesman, receives a monthly commission of $5.75 each on sales of the first 50 cleaners; $6.45 each on sales of the next 10 cleaners; and $7.10 each on additional sales. Last month he sold 62 cleaners. What was his total commission for the month?

2. Henry Smith, book agent, sells 2 types of dictionaries, one selling for $9.00 and the other for $15.00. On sales of the volume selling for $9.00, he receives a commission of 10%. On sales of the one selling for $15.00, he receives 12%. During one week he sells 35 of the cheaper type and 18 of the more expensive type. Find his total commission for the week.

3. Marston, a salesman, is paid 8% on the first $2,000 of monthly sales, 10% on the next $2,000 of monthly sales, and 12% on all monthly sales in excess of $4,000. His sales in November amounted to $3,950, and in December, to $5,125. What was his total commission for the two months?

4. The firm of French & Walker pays its salesmen a straight commission on sales each month as follows: 5% on all sales up to and including $8,500 and 7½% on all sales above that amount. Harold Cromie, one of the salesmen, sold goods amounting to $8,165 in May and $8,955 in June. Find the total amount of commission Cromie received for the two months.

5. Ernest Wheeler, a paint salesman, receives $8\frac{1}{2}\%$ commission on all sales and an additional $2\frac{1}{2}\%$ on sales in excess of $6,000 in any single month. His sales in June were $6,940 and in July, $5,720. Find the total commission that Wheeler received for the two months.

Exercise 41. (*Written*)

1. Walter Joslin, a salesman, receives a monthly commission of 5% on all sales up to and including $8,000 and 8% on all sales above that amount. In April, Joslin's sales amounted to $7,200 and in May, $8,400. (a) What was Joslin's total commission for April? (b) What was his total commission for May? (c) His commission for May was what per cent greater than his commission for April?

2. The Calumet Agency pays Julian Howe, a salesman, 5% commission on the first $10,000 of sales and 6% commission on all sales in excess of $10,000. In May, Howe's sales amounted to $11,000 and in June, $9,800. His commission for June was what per cent smaller than his total commission for May?

3. Alfred Lorey, a salesman, receives a straight commission of 5% on all sales and an additional 2% on sales in excess of $6,000 in any single month. (a) If his sales last month amounted to $5,700, what was the amount of his commission for the month? (b) If, during the present month, he is able to increase his sales by 20%, what will be his total commission for this month?

4. A salesman is paid 6% commission on total monthly sales and an additional $1\frac{1}{2}\%$ on monthly sales in excess of $8,000. In August his total sales amounted to $9,500. (a) What was his total commission for the month of August? (b) If his sales decreased 32% in September, what was the amount of his commission for September?

PERCENTAGE (*Continued*)

Types of Problems Involving Per Cent Relationships. A per cent, you have seen, is another way of expressing the fractional relationship of two numbers. There are, therefore, six general types of problems in per cent relationships, corresponding with the six types of problems in fractional relationships that you have studied in the first two sections of this unit. The six types of problems in per cent relationships are as follows:

1. To find a per cent of a number.
2. To find a number that is a given per cent greater (or smaller) than a known number.
3. To find what per cent one number is of another.
4. To find the per cent that one number is greater (or smaller) than another.
5. To find a number when a given per cent of it is known.
6. To find a number when an amount that is a given per cent greater (or smaller) than the number is known.

The methods of solving problems indicated as Types 1 and 3 have already been explained in a preceding section.

The principles and methods involved in Types 2, 4, 5, and 6 are discussed in the remainder of this unit.

To Find the Per Cent That One Number Is Greater (or Smaller) than Another. In Problem 1 of Exercise 41 on page 114, you had to find the per cent that the May commission was greater than the April commission; and in Problem 2, you had to find the per cent that the June commission was smaller than the May commission.

To find the per cent that one number is greater (or smaller) than another number, first subtract the smaller from the larger to find the number representing the part. Then divide this number by the number representing the whole, or the base, and express the result as a per cent.

Example 1: 20 is what per cent greater than 16?

Solution

$20 - 16 = 4$

$\frac{4}{16} = \frac{1}{4} = 25\%$ *Ans.*

Analysis and Explanation

20 is 4 greater than 16. 4 is therefore the number representing the part. The expression "greater than 16" means that 16 is the number with which the part, 4, is to be compared. Therefore the fraction $\frac{4}{16}$ expresses the fractional relationship of 4 to 16. $\frac{4}{16} = \frac{1}{4} = 25\%$. Hence, 25% expresses the per cent by which 20 is greater than 16.

Proof: $16 + 25\%$ of $16 = 16 + 4 = 20$

Example 2: 16 is what per cent smaller than 20?

Solution

20 − 16 = 4

$\frac{4}{20} = \frac{1}{5} = 20\%$ *Ans.*

Analysis and Explanation

16 is 4 smaller than 20. 4 is therefore the number representing the part. The expression "smaller than 20" means that 20 is the number with which the part, 4, is to be compared. Therefore the fraction $\frac{4}{20}$ expresses the fractional relationship of 4 to 20. $\frac{4}{20} = \frac{1}{5} = 20\%$. Hence, 20% expresses the per cent by which 16 is smaller than 20.

Proof: 20 − 20% of 20 = 20 − 4 = 16

Exercise 42. (*Oral*)

1. $8 is what % less than $10?
2. $8 is what % of $10?
3. $10 is what % more than $8?
4. $10 is what % of $8?
5. $30 is what % more than $20?
6. What % of $20 is $30?
7. What % less than $30 is $20?
8. What % of $30 is $20?
9. $15 is what % of $5?
10. $15 is what % more than $5?
11. What % more than $10 is $25?
12. What % of $10 is $25?
13. $25 is what % less than $30?
14. $11 is what % of $5?
15. What % more than $5 is $11?
16. What % less than $40 is $25?
17. $12 is what % more than $6?
18. What % of $6 is $12?
19. A number 20% more than 25 is what % of 25?
20. What % of 25 is the number that is 20% less than 25?
21. What % of 20 is the number that is 25% more than 20?
22. A number 10% less than 20 is what per cent of 20?
23. What % of 15 is the number that is $33\frac{1}{3}\%$ less than 15?

To Find a Number That Is a Given Per Cent Greater (or Smaller) than a Known Number. In Problem 3 of Exercise 41 on page 114, you had to find the amount that is 20% greater than $5,700 in order to obtain the amount of this month's sales; and in Problem 4, you had to find the amount that is 32% smaller than $9,500 in order to obtain the amount of sales for September.

An expression such as "15% greater than 20" or "15% more than 20" means "15% of 20 *added* to 20"; that is, 20 + 15% of 20. The result is 20 + 3, or 23.

Similarly, an expression such as "15% smaller than 20" or "15% less than 20" means "15% of 20 *subtracted* from 20"; that is, 20 − 15% of 20. The result is 20 − 3, or 17.

Example 1: 20 *increased* by 15% of itself equals what number?

Analysis: "20 increased by 15% of itself" means "*add* 15% of 20 to 20." The desired number therefore equals the known number, 20, *plus* the amount of the increase, 15% of 20. Stated in the form of an equation,

$$20 + 15\% \text{ of } 20 = \text{the desired number.}$$

Solution:

$$\begin{array}{rrl} & 20 & = \textit{the known number} \\ 15\% \textit{ of } 20 = & \underline{+3} & = \underline{\textit{the increase}} \\ & 23 & = \textit{the desired number} \quad \textit{Ans.} \end{array}$$

Example 2: 20 *decreased* by 15% of itself equals what number?

Analysis: "20 decreased by 15% of itself" means "*subtract* 15% of 20 from 20." The desired number is therefore equal to the known number, 20, *minus* the decrease, 15% of 20. Stated in the form of an equation,

$$20 - 15\% \text{ of } 20 = \text{the desired number.}$$

Solution:

$$\begin{array}{rrl} & 20 & = \textit{the known number} \\ 15\% \textit{ of } 20 = & \underline{-3} & = \underline{\textit{the decrease}} \\ & 17 & = \textit{the desired number} \quad \textit{Ans.} \end{array}$$

Exercise 43. (Oral)

What amount is:

1. 10% greater than $200?
2. 10% smaller than $200?
3. 10% as much as $200?
4. 25% less than $160?
5. $350 decreased by 20%?
6. $\frac{1}{2}$% larger than $600?
7. 150% more than $20?
8. 150% as great as $20?
9. $12 increased by 125%?
10. $36 decreased by 33$\frac{1}{3}$%?
11. $\frac{1}{8}$% of $2,800?
12. $\frac{1}{4}$% more than $1,200?
13. 200% of $30?
14. 200% more than $30?
15. $15 increased by 400%?
16. $50 increased by 120%?

Problems for Application and Review

Group A

1. (a) What amount is 35% greater than $18? (b) What per cent of $15 is $18? (c) Find 135% of $95. (d) $120 is what per cent greater than $96? (e) $3.50 decreased by 16% of itself gives what amount? (f) $3.50 is what per cent less than $5.25? (g) What amount is $\frac{3}{8}$% of $1,720? (h) Express 3.62$\frac{1}{2}$ as a mixed number.

2. A salesman receives $150 a month salary and 5% commission on all sales and an additional $\frac{1}{2}$% on sales in excess of $6,000 in any single month. His sales in June were $5,600 and in July, $6,950. (a) Find his total commission. (b) Find his total earnings for the two months.

3. Coleman receives a salary of $90 a week as a salesman. Dwyer receives a salary of $50 a week and a commission of 2% on all automobiles he sells. At the end of 32 weeks Dwyer's sales amount to $75,225. (a) Which salesman has earned the larger income? (b) How much larger?

4. A worker is paid a regular wage of $1.96 an hour for 8 hours a day from Monday through Friday with time and a half for overtime on these days and double time for work on Saturday and Sunday. During one week he worked nine hours each day, Monday through Sunday. Find his total earnings for the week.

Group B

1. (a) $165 is what per cent greater than $120? (b) What amount is 18$\frac{1}{2}$% less than $48? (c) What amount is 215% of $32? (d) What per cent of 25 is 40? (e) 270 is what per cent less than 450? (f) What amount is 62$\frac{1}{2}$% greater than $44?

2. Green, a salesman, receives a monthly salary of $175 and a 5% commission on all sales. In addition, he receives a commission of 1$\frac{1}{2}$% on all sales in excess of $5,000 in any single month. His sales in November amounted to $6,680 and in December to $4,550. (a) Find Green's total commission. (b) Find his average monthly earnings for the two months.

3. A wholesaler engaged W. E. Clark as a salesman, agreeing to pay him $225 a month and 7% commission on all sales over $44,000 for the year. During last year Clark's sales amounted to $96,500. What was Clark's average monthly income?

4. A firm pays its employees on the basis of a 40-hour week with time and a half for overtime. Hawley worked 39 hours during the week ending June 7 and 45 hours during the week ending June 14. Find Hawley's total wages for the two weeks if his regular hour rate is $1.65.

Section 7 . . . Commission Rates

To Find the Rate of Commission on Sales. Sometimes the sales and the amount of commission are known, and it is desired to find the rate of commission. Since the rate of commission is always based on the sales, the sales represent the base, or the whole, and the amount of commission represents the part. The problem is therefore one in finding what per cent the commission is of the sales. The per cent, or rate of commission, may be found by dividing the commission by the sales. Hence,

$$\text{Rate of Commission} = \text{Commission} \div \text{Sales}$$

or

$$\text{Rate of Commission} = \frac{\text{Commission}}{\text{Sales}}$$

Example: For selling goods amounting to \$3,000 a salesman received \$150. What per cent commission did he receive?

Solution 1

$\$150 \div \$3{,}000 = .05 = 5\%$ *Ans.*

Solution 2

$\$\frac{150}{3{,}000} = \frac{1}{20} = 5\%$. *Ans.*

Exercise 44. (*Written*)

1. An agent who takes subscriptions for a magazine that costs \$1.50 a year receives a commission of 48¢ on each annual subscription. What per cent commission does he receive?

2. For selling merchandise amounting to \$8,240 in one month, a salesman received a commission of \$370.80. What per cent commission did he receive?

3. Last month a salesman sold merchandise amounting to \$7,800. His total earnings for the month were \$325.50, of which \$150 represented his regular guaranteed monthly salary. (a) How much commission did he earn last month? (b) What per cent commission did he receive?

4. For selling merchandise amounting to \$5,750 in one month, a salesman received a commission of \$178.75. This is what per cent on all sales over \$3,000, the salesman's quota?

5. In one week a sales clerk whose quota is \$800 sold merchandise amounting to \$1,174. Her weekly salary is \$39.50. (a) If her total earnings for the week were \$48.85, how much commission did she earn? (b) What per cent commission did she receive?

To Find the Amount of the Sales When the Amount of Commission and Rate of Commission Are Known. In certain situations you will be required to find the amount of sales a salesman should make in order to earn a stated amount of commission.

Example: The Brightwater Manufacturing Company offers to pay a salesman a straight commission of 5%. How many dollars' worth of goods must he sell in one week in order that his commission for the week may be $90?

Analysis: A salesman's per cent commission is always based on the sales. Therefore the 5% given in the problem means "5% of the sales," or "5% times the sales." The $90 given in the problem is the amount of the commission. The problem tells us, therefore, that 5% of the sales is equal to $90. In other words,

$$5\% \times \text{Sales} = \$90$$

$90 is the product, and 5% is one of the factors of $90. The value of the other factor, Sales, is unknown. As you have learned in a preceding section, the unknown factor of a product can be found by dividing the product by the known factor. Hence, the value of the unknown factor, Sales, may be found by dividing $90 by 5%.

Solution:

$$\begin{aligned} 5\% \times \textit{Sales} &= \$90 \\ \textit{Sales} &= \$90 \div 5\% \\ &= \$90 \div .05 = \$1{,}800\ \textit{Ans.} \end{aligned}$$

Proof: Rate of Commission × Sales = Commission

$$5\% \times \$1{,}800 = .05 \times \$1{,}800 = \$90$$

It is important to note that the $90 given in the foregoing problem should *not* be multiplied by the given rate of commission, 5%, because the rate of commission is based on the sales. *The number representing the sales, and only the number representing the sales, may be multiplied by the 5%.* The $90 represents the amount of the commission, not the amount of the sales.

In every problem in which the rate of commission is given, the amount of the commission is the product of the sales and the rate. That is,

Rate of Commission × Sales = Commission

The rate of commission and the sales represent the factors, and the commission represents the product. If the commission and the rate of commission are given in the problem, the unknown factor (Sales) may be found by dividing the product (Commission) by the known factor (Rate of Commission). Hence,

$$\textbf{Sales} = \textbf{Commission} \div \textbf{Rate of Commission}$$

or

$$\textbf{Sales} = \frac{\textbf{Commission}}{\textbf{Rate of Commission}}$$

Exercise 45. (Written)

1. Douglas Manville is offered a position as salesman with Vogel Brothers on a straight commission basis of 7½% on all sales. How many dollars' worth of goods must he sell in one month in order that his commission for the month may be $345?

2. A salesman receives a commission of 6% on his sales. In order to receive $195 commission, what should be the amount of his sales?

3. A salesman receives a salary of $200 a month and a commission of 4% on all sales. What must be the amount of his sales each month in order that his total monthly income may be $450?

4. A salesman is paid a weekly salary of $60 with a 5% commission on all sales over $1,000 a week. What must be the total amount of his sales for one week in order that his total income for the week may be $125?

5. A salesman receives a monthly salary of $215 with a 7½% commission on all sales over $4,000 a month. What must be the total of his sales for the current month in order that his total income for the month may be $500?

PERCENTAGE (Continued)

Important Principle of Per Cent Relationships. Since a per cent is simply another way of expressing the fractional relationship of two numbers, it follows that the principles of fractional relationships, which you studied on page 82, apply also to relationships that are expressed as per cents. Thus, in the expression, "16 is 20% of 80," 16 is the part, and 80 is the whole with which 16 is compared, or the number on which the comparison is based. Therefore 80 is referred to as the *base of the per cent,* or simply the *base*; and the per cent, 20%, is said to be *based* on 80.

As in the case of fractional relationships, so in the case of per cent relationships, *the number representing the base, and only the number representing the base, may be multiplied by the per cent.*

The number representing the base is usually indicated by the number, either expressed or implied, which follows immediately the expression that indicates multiplication—an expression such as "times," "of," "greater than," etc. Thus, in each of the following problems 80 is the base since the number 80 follows immediately the expression indicating multiplication. 80 may therefore be multiplied by the per cent.

What number is 20% *as large as* 80?
20% *of* 80 is what number?
What number is 20% *smaller than* 80?

In problems such as those given below, however, the *unknown number* is the base, because the term "what number" follows immediately the expression indicating multiplication. In these problems the known number, 60, may *not* be multiplied by the per cent, because 60 *does not represent the base.*

60 is 20% *as large as* what number?
20% *of* what number equals 60?
60 is 20% *greater than* what number?

Problems such as the three given immediately above cannot be solved by multiplying the known number by the per cent. The method of solving such problems is explained below.

Exercise 46. (*Oral*)

In each of the following, state whether the known number may or may not be multiplied by the per cent to find the correct answer.

1. What number is 20% of 15?
2. 16 is 40% of what number?
3. $60 is 30% of what amount?
4. What amount is 60% of $18?
5. $18 is 60% of what amount?
6. What amount is 35% as great as $70?
7. $70 is 35% as great as what amount?
8. 45 is 20% times what number?
9. What number is 20% times 45?
10. 15% of what number equals 60?

To Find a Number When a Given Per Cent of It Is Known. When the value of a given per cent of a number is known and it is desired to find what that number is, the problem is one in finding the number on which the given per cent is based. This is essentially a problem in finding the unknown factor when the other factor and the product are known.

Example: 48 is 12% of what number?

Analysis: The problem tells us that 12% of a certain unknown number is equal to 48. Stated in equation form,

$$12\% \times \text{the unknown number} = 48$$

48 is the product, and 12% is one of the factors of 48. The other factor of 48 is the unknown number. As you have learned in a preceding section, the unknown or missing factor of a product can be found by dividing the product by the known factor. Hence, in the foregoing problem, the unknown number may be found by dividing 48 by 12%.

Solution: $12\% \times \textit{the unknown number} = 48$
$\textit{The unknown number} = 48 \div 12\%$
$= 48 \div .12 = 400$
Ans.

Proof: $12\% \times 400 = .12 \times 400 = 48$

Exercise 47. (*Oral*)

1. 10% × what number = 35?
2. 30% × what amount = $24?
3. 90% × what amount = $27?
4. $22 is 50% of what amount?
5. What amount is 50% of $22?
6. $20 is 25% of what amount?
7. $36 is 75% of what amount?
8. $16\frac{2}{3}\%$ of $42 = what amount?
9. $16\frac{2}{3}\%$ of what amount = $42?
10. 100% of $48 is what amount?
11. 100% of what amount is $60?
12. 200% of $16 is what amount?
13. What amount is 300% of $12?
14. 200% × what amount = $16?
15. $12 is 300% of what amount?
16. 150% × $30 = what amount?
17. 150% × what amount = $30?
18. $39 is 130% of what amount?
19. 120% of what amount is $48?
20. $75 is 250% of what amount?

Exercise 48. (*Oral*)

What is 1% of an amount:

a. If 2% of the amount is $4? $10? $18? $64? $150?
b. If 3% of the amount is $6? $15? $36? $60? $120?
c. If 6% of the amount is $12? $30? $60? $72? $180?
d. If 9% of the amount is $27? $54? $180? $360? $72?
e. If $\frac{1}{2}\%$ of the amount is $4? $10? $18? $64? $150?
f. If $\frac{1}{5}\%$ of the amount is $10? $25? $40? $2? $15?

Exercise 49. (*Oral*)

What is 100% of an amount:

a. If 1% of the amount is $2? $18? $60? $1? $120? $10?
b. If 2% of the amount is $4? $10? $18? $64? $150?
c. If 3% of the amount is $6? $15? $36? $60? $120?
d. If 5% of the amount is $20? $35? $150? $350? $45?
e. If 8% of the amount is $40? $80? $160? $8? $120?
f. If $\frac{1}{2}\%$ of the amount is $4? $10? $1? $150? $2?
g. If $\frac{1}{5}\%$ of the amount is $10? $8? $15? $1? $5?

Exercise 50. (*Oral*)

1. $4 is 1% of what amount?
2. $3 is 1% of what amount?
3. $24 is 6% of what amount?
4. $15 is 5% of what amount?
5. $18 is 3% of what amount?
6. $27 is 9% of what amount?
7. $150 is 2% of what amount?
8. $2 is 1% of what amount?
9. $7 is 1% of what amount?
10. $2 is $\frac{1}{2}\%$ of what amount?
11. $7 is $\frac{1}{2}\%$ of what amount?
12. $3 is $\frac{1}{4}\%$ of what amount?
13. $4 is $\frac{1}{5}\%$ of what amount?
14. $6 is $\frac{2}{5}\%$ of what amount?

Problems for Application and Review

Group A

1. (a) $255 is $\frac{3}{5}$ of what amount? (b) Find $\frac{3}{4}\%$ of $192. (c) $3.24 is 72% of what amount? (d) What amount is 4.5% less than $230? (e) What per cent of 225 is 90? (f) $245 is what per cent greater than $210? (g) 180 is what per cent of 72?

2. John Miller, a salesman, receives a monthly salary of $180 and a 5% commission on all sales. In addition, he receives a commission of 2% on sales in excess of $6,000 in any single month. His sales in April amounted to $7,700 and in May to $5,400. Find his average monthly income for the two months.

3. C. R. Lawton, a salesman, is employed on a salary-plus-commission basis. His total earnings for last year amounted to $6,000, of which $2,500 represented his guaranteed annual salary. If his total sales last year amounted to $43,750, what per cent commission did he receive?

4. If a salesman's commission is 5% on sales, how much must he sell each week in order to earn $65?

5. A man saves 20% of his earnings. If he receives $350 a month, in how many years can he pay for a building lot costing $2,100?

Group B

1. (a) What amount is 4⅓% of \$450? (b) \$324 is ¾ of what amount? (c) What per cent of 170 is 255? (d) What amount is 115% greater than \$24? (e) \$1.50 is what per cent less than \$2.40? (f) \$15.86 is 65% of what amount?

2. Brown, a salesman, is paid \$250 a month and a 4% commission on all sales in excess of \$50,000 for the year. Last year his sales amounted to \$54,780. What were his average monthly earnings for the year?

3. A sales clerk is paid \$42.50 a week plus a commission on all sales in excess of \$700 in any single week. Last week her total sales amounted to \$1,430. If her total earnings for the week were \$53.45, what rate of commission did she receive?

4. A salesman working on a 5% straight-commission basis earned \$4,250 last year. What was the value of the goods he sold?

5. A salesman's average sales for 9 weeks were \$595.25 a week. After computing that average, he worked 3 weeks and his sales amounted to \$564.70, \$495.30, and \$573.95, respectively. Find his average weekly sales for the 12 weeks.

Group C

1. (a) 1,125 is what per cent of 375? (b) \$9.60 is what per cent greater than \$7.20? (c) 63 is ⅔ of what number? (d) What amount is 2⅔% of \$135? (e) \$720 is 4½% of what amount? (f) What amount is 6.5% less than \$340?

2. Last month a salesman sold goods amounting to \$9,000. His total earnings for the month were \$400, of which \$175 was his monthly salary. What rate of commission did he receive?

3. If a salesman's commission is 8%, how many dollars' worth of goods must he sell in order to earn \$200?

4. If a salesman is paid \$40 a week plus a commission of 3% on all sales, what must be the amount of his sales each week in order that his total weekly income may be \$85?

5. A man works each day from 9:00 a.m. to 4:30 p.m., with 30 minutes out for lunch, except on Saturday, when he quits at 12 noon. What did he earn last week at \$1.87½ an hour if he worked full time except for 2½ hours lost on Tuesday?

Agents' Commissions. A person who is in business for himself, acting as an *agent* for others, usually receives some form of commission in payment for his services. The person for whom the agent acts is known as the *principal.*

A real estate agent, for example, may be engaged, or *commissioned,* by the owner of a dwelling house to find a buyer and to make the necessary arrangements for completing the sale of the property. In such cases, the agent, by agreement with the owner, or principal, is entitled to receive a specified per cent of the sale price of the property in payment for his services. He may also be entitled to receive reimbursement for legal expenses, transfer taxes, and other expenses that he has incurred in connection with the sale of the property. The net amount that the principal receives, after deducting the agent's commission and expenses from the sale price, is often referred to as the *net proceeds.*

Similarly, a person who is in business as a collection agent, to collect unpaid bills owed to business firms or individuals, usually receives a per cent of the amount collected. Also, by agreement with the principal, or client, the agent may be entitled to reimbursement for expenses incurred in making the collection. The net proceeds of the transaction is the amount that the principal receives after deducting the agent's commission and expenses.

To Find the Amount of the Agent's Commission. The commission of a selling agent, such as a real estate agent, is based on the sale price of the property sold. Therefore, the amount of the agent's commission is the product of the rate of commission and the sale price. Expressed as a formula,

$$\textbf{Rate of Commission} \times \textbf{Sale Price} = \textbf{Commission}$$

Thus, if a house and lot are sold for $8,000 through a real estate agent who charges 5% commission, the calculation of the agent's commission would be:

$$.05 \times \$8{,}000 = \$400, \text{ commission}$$

The commission of a collection agent is based on the amount collected. Expressed as a formula,

$$\textbf{Rate of Commission} \times \textbf{Amount Collected} = \textbf{Commission}$$

To Find the Net Proceeds Received by the Principal. The net proceeds is the amount received by the principal, after deducting the agent's commission and any expenses incurred in connection with the transaction. This may be expressed by the formula,

Sale Price − Commission − Expenses = Net Proceeds

or

Amount Collected − Commission − Expenses = Net Proceeds

Example: R. C. Rand, a collection agent, collected an outstanding bill of $800 for Rice & Co. He charged 10% commission and $30 for expenses. What net proceeds did the company receive?

Solution

Amount Collected		*$800*
Deductions:		
Commission (10% of $800)	*$80*	
Expenses	*30*	*110*
Net Proceeds		*$690*

In cases where the agent's commission is the only deduction, the formula for the net proceeds would be:

Sale Price − Commission = Net Proceeds

or

Amount Collected − Commission = Net Proceeds

Exercise 51. (*Written*)

1. Earl Winsor, a real estate agent, sold a house for Howard Porter for $8,350 and charged $4\frac{1}{2}$% commission. How much commission did Winsor receive?

2. Harry Pearson, an auctioneer, sold goods amounting to $6,937.50 for the Central Mercantile Agency and charged 15% commission. How much commission did he receive?

3. Newton Ferris, a collection agent, collected an outstanding bill of $1,345 for the Melrose Milling Corporation and charged 8% for his services. What net proceeds did the company receive?

4. A collection agent who charges 12% commission collected 70% of a debt of $935. How much commission did he retain?

5. The J. B. Hauf Company gave a collection agent an account amounting to $570 to collect. How much did the company receive if the agent collected 65% of the account and charged 7% for collecting?

6. A real estate agent sold an apartment house for $57,250. How much did the original owner receive if the agent charged $4\frac{1}{2}$% for commission and $283 for expenses?

To Find the Sale Price or Amount Collected When the Amount of the Net Proceeds and the Rate of Commission Are Known. If the net proceeds and the rate of commission are known, and it is desired to find the sale price or the amount collected, the problem is one in finding the number on which the given rate per cent is based.

Example: A collection agent remitted to his principal $450 after deducting 10% for collecting an account. What was the amount collected?

Analysis: The per cent given in the problem is the rate of commission. Since a collector's rate of commission is always based on the amount collected, the amount of the commission is 10% *of the amount collected.* The problem therefore tells us that if 10% of the amount collected is subtracted from the amount collected, the remainder is $450. Stated as an equation,

Amount Collected − 10% of Amount Collected = $450

(1) Since the amount of the commission is 10% *of the amount collected*, the amount collected represents the *base*, or the whole and is therefore 100% of itself.

(2) The amount of the commission is 10% of the amount collected.

(3) The difference between the amount collected and the amount of the commission is therefore 90% of the amount collected. This difference represents the net proceeds, which, according to the problem, is $450.

Solution:

$$\begin{array}{rl} 100\% \times \textit{Amount Collected} & = \textit{Amount Collected} \\ \underline{-10\%} \times \textit{Amount Collected} & = \underline{\textit{Commission}} \\ 90\% \times \textit{Amount Collected} & = \textit{Net Proceeds } (\$450) \\ \textit{Amount Collected} & = \$450 \div 90\% \\ & = \$450 \div .9 = \$500 \\ & \qquad\qquad \textit{Ans.} \end{array}$$

Proof: Amount Collected − Commission = Net Proceeds
$500 − 10% of $500 = $500 − $50 = $450

Exercise 52. (*Written*)

1. A collection agent sent his principal $382.50 after deducting 15% for collecting an account. What was the amount of the account collected?

2. Jessie Turner sold a house and lot through a real estate agent who charged 4% commission. Her net proceeds, after paying the agent's commission, amounted to $14,880. What was the sale price of the house and lot?

3. A real estate agent sold a house and, after deducting 5% commission, remitted $17,575 to the former owner. What was the sale price of the house?

4. An attorney who specializes in collecting bad accounts charges 22% for making collections. Last week he collected an account and remitted to his client $643.50 after deducting the amount of his commission. How much did he collect?

5. What should be the sale price of a house and lot in order that the owner may realize $16,625 on the sale after paying the real estate agent a commission of 5%?

6. Guy Stacey, the owner of a house and lot, wishes to sell the property at a price that will bring him at least $8,400 after deducting the real estate agent's commission of 5%. Find the lowest price, to the nearest ten dollars, at which he may sell the property and still realize not less than $8,400 after paying the agent's commission.

Exercise 53. (*Written*)

1. Howard Paddock, a real estate agent, earned commissions totaling $315 during the month of June. This was 10% less than the amount he earned in May. How much did he earn in May?

2. In the month of October, a collection agent's commissions totaled $408, which was 15% below the total for September. What were his total commissions for September?

3. A property owner sold a house and lot for $7,590, which was 8% less than his asking price. What was his asking price?

4. A real estate agent was able to sell a piece of property for $14,175, which was 5% more than the owner's asking price. What was the asking price?

5. A real estate agent's total commission for September amounted to $435, which was a 16% increase over the August amount. What was the August amount?

PERCENTAGE (*Concluded*)

To Find a Number When an Amount That Is a Given Per Cent Greater (or Smaller) than the Number Is Known. An expression such as "18 is 20% greater than another number," "18 is 20% more than another number," or "18 equals what number increased by 20% of itself?" means that 18 is the result of *adding* 20% of the unknown number to the unknown number.

Similarly, an expression such as "18 is 20% smaller than another number," "18 is 20% less than another number," or "18 equals what number decreased by 20% of itself?" means that 18 is the result of *subtracting* 20% of the unknown number from the unknown number.

In cases such as those mentioned above, the problem of finding the unknown number is a problem in finding the number on which the given per cent is based. This is essentially a problem in finding the unknown factor when the other factor and the product are known.

Example 1: What number increased by 20% of itself equals 18?

Analysis: The problem tells us that if 20% of a certain unknown number is added to that number, the sum is 18. Stated in the form of an equation,

The unknown number + 20% of the unknown number = 18

(1) Since the increase is 20% *of the unknown number*, this unknown number represents the base, or the whole, and is therefore 100% of itself.

(2) The increase is 20% of the unknown number.

(3) The sum of the unknown number and the increase is therefore 120% of the unknown number. This sum, according to the problem, is 18.

Solution:

$$\begin{aligned}
100\% \times \textit{the number} &= \textit{the number} \\
\underline{+20\%} \times \textit{the number} &= \underline{\textit{the increase}} \\
120\% \times \textit{the number} &= \textit{the number} + \textit{the increase} \\
&= 18 \\
\textit{The number} &= 18 \div 120\% \\
&= 18 \div \tfrac{6}{5} = 15 \textit{ Ans.}
\end{aligned}$$

Proof: 15 + 20% of 15 = 15 + 3 = 18

Exercise 54. (*Oral*)

1. What amount + 50% of itself = \$36?
2. What amount plus 25% of itself equals \$60?
3. What amount increased by 25% equals \$80?
4. \$40 is what amount increased by 25%?
5. 150% of what amount = \$24?
6. What amount is 50% of \$24?
7. \$24 is 50% more than what amount?
8. \$60 is 120% of what amount?
9. \$30 is 20% more than what amount?
10. What amount is $33\frac{1}{3}\%$ of \$24?
11. \$24 is $33\frac{1}{3}\%$ greater than what amount?
12. \$28 is what amount increased by 75%?
13. What amount increased by $66\frac{2}{3}\%$ equals \$45?

Example 2: What number decreased by 20% of itself equals 18?

Analysis: The problem tells us that if 20% of a certain unknown number is subtracted from that number, the remainder is 18. Stated in equation form,

The unknown number − 20% of the unknown number = 18

Solution:

$$\begin{aligned} 100\% \times \textit{the number} &= \textit{the number}\\ \underline{-20\%} \times \textit{the number} &= \underline{\textit{the decrease}}\\ 80\% \times \textit{the number} &= \textit{the number} - \textit{the decrease}\\ &= 18\\ \textit{The number} &= 18 \div 80\%\\ &= 18 \div .8 = 22.5 \textit{ Ans.}\end{aligned}$$

Proof: 22.5 − 20% of 22.5 = 22.5 − 4.5 = 18

Exercise 55. (*Oral*)

1. What amount − 20% of itself = \$40?
2. What amount minus 25% of itself = \$60?
3. What amount decreased by 25% of itself = \$36?
4. \$60 is what amount decreased by $33\frac{1}{3}$ of itself?
5. What amount is $33\frac{1}{3}\%$ of \$36?
6. \$36 is $33\frac{1}{3}\%$ less than what amount?
7. 20% of \$40 is what amount?
8. 80% of what amount = \$40?
9. \$60 is 20% less than what amount?
10. \$18 is equal to what amount decreased by $66\frac{2}{3}\%$?
11. What amount decreased by 75% is equal to \$12?

Review of Types of Problems Involving Per Cent Relationships. In this and the preceding sections you have studied six different general types of problems involving per cent relationships. The exercise given below provides review practice in solving each of these types of problems.

Exercise 56. (Oral)

1. What amount is 60% as much as $15?
2. What amount is 25% more than $48?
3. $45 diminished by 10% of itself equals what amount?
4. 12 is what per cent of 15?
5. $48 is what per cent more than $40?
6. What per cent less than 48 is 40?
7. $36 is 75% as much as what amount?
8. $40 is 25% more than what amount?
9. What number diminished by 30% of itself equals 70?
10. $60 is $33\frac{1}{3}$% less than what amount?
11. $60 is $33\frac{1}{3}$% more than what amount?
12. $36 is 150% of what amount?
13. What per cent more than 10 is 12?
14. 60 is 25% less than how many?
15. A number 4 times as large as 5 is what per cent of 30?
16. $36 is 50% larger than what amount?
17. What per cent more than $12 is $16?
18. $40 is 20% less than what amount?
19. What amount is 75% more than $36?
20. What number is 160% of 30?
21. $50 is 150% more than what amount?
22. What amount is 75% smaller than $80?
23. 30 is 120% of what number?
24. $5 is what per cent less than $50?

Per Cent Increase or Decrease. In one's personal or business affairs it is often desirable to compare quantities or amounts that apply to two successive periods of time. A householder, for example, may find it desirable to compare his total household expenses for the present month with the total for last month, and calculate the per cent increase or decrease. Similarly, a salesman may find it desirable to compare his commission in one month with that of a former month, or his total sales for one year with the total for the preceding year. When comparisons of this kind are made, it is customary to base the comparison on the amount that applies to the *earlier* period of time.

Example: For the month of August the total household expenses of the James Higley family were $72 and for the month of July, $80. What was the per cent increase or decrease in household expenses?

Solution

$80 − $72 = $8, decrease
$\$\frac{8}{80} = \frac{1}{10} = 10\%$
Ans. 10% decrease

Proof: $80 − 10% of $80 =
$80 − $8 = $72

Explanation

The comparison must be based on the amount for July, because July is the earlier month. Since the expense for August is smaller than for July, the difference between the two amounts represents a decrease. The decrease, $8, is divided by $80, the expense for July, to find the per cent decrease.

Exercise 57. (Written)

1. Dorothy Joyce saved $140 of her salary last year and $125 the year before. What was the per cent increase or decrease in savings?

2. On April 1 the price per ton for coal dropped to $20.00 from $22.50. What was the per cent decrease in price?

3. Gerald Hopkins now pays $19.50 a pair for shoes that he could formerly purchase for $11.50. What is the per cent increase or decrease in price, to the nearest per cent?

4. A salesman sold $36,500 worth of goods year before last and $33,600 worth last year. Find the per cent increase or decrease in sales to the nearest tenth per cent.

5. Robert Frick, a salesman for the Franklin Publishing Company, sells dictionaries and encyclopedias. For the year 1954 his sales were as follows: dictionaries, $23,500; encyclopedias, $50,480. For the year 1953 his sales were: dictionaries, $19,500; encyclopedias, $54,000. Find to the nearest tenth per cent the increase or decrease in sales of each type of book.

Problems for Application and Review

Group A

1. (a) $76.50 is 10% less than what amount? (b) What amount is $16\frac{2}{3}\%$ greater than $507.90? (c) $455 is $3\frac{1}{2}\%$ of what amount? (d) What per cent less than 112 is 42? (e) 300 is $\frac{4}{5}$ of what number? (f) What per cent of $12.50 is $31.25?

2. A real estate agent sold an apartment house for $62,500. How much did the original owner receive if the agent deducted 4% commission and his expenses amounted to $362?

3. A. H. Jones gave an agency an account amounting to $800 to collect. The agency collected 60% of the amount and charged 10% for collecting. How much did Jones receive?

4. A real estate agent, who charges 5% commission, received $620 for selling a house and lot. What was the selling price of the property?

5. What should be the sale price of a house and lot in order that the present owner may realize $15,200 on the sale after paying the real estate agent a commission of 5%?

6. An agency sold 1,420 trucks last year and 1,136 the year before. Find the per cent increase or decrease.

Group B

1. (a) $16.50 is $\frac{6}{5}$ of what amount? (b) Find $\frac{5}{8}$% of $1,520. (c) What per cent of $22.50 is $2.50? (d) 45¢ is $7\frac{1}{2}$% of what amount? (e) What amount increased by 5% of itself gives $2.52? (f) $5.32 is 5% less than what amount?

2. A real estate agent, on a 4% commission basis, received $384 for selling a piece of property. What was the selling price of the property?

3. G. E. Getman gave an agency an account amounting to $500 to collect. The agency collected 75% of the account and charged 5% for collecting. How much did Getman receive?

4. What should be the sale price of a house and lot in order that the present owner may realize $12,000 on the sale after paying the real estate agent a commission of 4%?

5. A collector sent his principal $4,072.89 after deducting $4\frac{3}{4}$% for collecting an account. Find the amount of the account collected.

6. In a period of 20 weeks John increased his average typing speed from $27\frac{1}{2}$ words to 44 words per minute. What was the per cent increase?

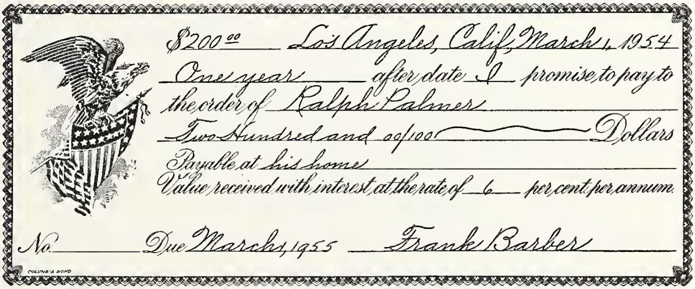
UNIT V

BORROWING MONEY

Section 1 . . . Borrowing on a Promissory Note

Promissory Notes. When a person borrows money, the lender generally requires him to sign a promissory note. If the note specifies that a certain rate of interest will be paid, it is known as an *interest-bearing note.*

For example, on March 1, 1954, Frank Barber, a college senior, borrowed $200 from his uncle, Ralph Palmer, to help him complete his senior year. He signed and gave to his uncle the following interest-bearing note in exchange for the loan.



$\$200^{00}$ Los Angeles, Calif, March 1, 1954

One year after date I promise to pay to

the order of Ralph Palmer

Two Hundred and 00/100 Dollars

Payable at his home

Value received with interest at the rate of 6 per cent per annum.

No. Due March 1, 1955 Frank Barber

COLUMBIA BOND

Interest-Bearing Note

In the above note, $200 is the *face* or *principal.* March 1, 1954, is the *date of the note.* One year is the *time.* Ralph Palmer, to whom the note is payable, is the *payee.* Frank Barber, who signed the note, is the *maker.* The *due date, or date of maturity,* is March 1, 1955, which is one year from March 1, 1954.

When the note is paid, the payee writes "Paid" across the face, followed by the date and his signature, and returns the note to the maker.

To Find the Interest on a Loan for One Year. In the note shown in the illustration, Frank Barber promises to pay the amount of the loan, \$200, "with interest at 6%." Unless otherwise stated, the interest rate specified in a note is an annual rate, or the rate for one year. Hence, the expression "with interest at 6%" means "with interest at the rate of 6% a year." Since Frank borrows the money for exactly one year, the interest he will pay is 6% of the amount borrowed, or 6% of \$200. The calculations for finding the amount of the interest would therefore be:

$$\text{Int. for 1 yr.} = \$200 \times .06 = \$12$$

The total amount that Frank must pay on the date of maturity is the face of the note plus the interest, \$200 + \$12, or \$212.

To Find the Interest on a Loan for a Period Other than One Year. The interest on a loan is proportional to the time for which the money is borrowed. For example, the interest on a loan for $\frac{1}{2}$ of a year is $\frac{1}{2}$ times the interest for 1 year; for $\frac{3}{4}$ of a year it is $\frac{3}{4}$ times the interest for 1 year; for $1\frac{1}{2}$ years it is $1\frac{1}{2}$ times the interest for 1 year; and so on.

Thus, if \$400 is borrowed at 5% for $2\frac{1}{2}$ years, the interest on the loan for $2\frac{1}{2}$ years is found as follows:

$$\text{(1) Int. for 1 yr.} = \$400 \times .05 = \$20$$

$$\text{(2) Int. for } 2\tfrac{1}{2} \text{ yr.} = \$20 \times 2\tfrac{1}{2} = \$50$$

Exercise 1. (*Written*)

1. On February 1 of the current year, Paul Dexter borrowed \$460 from Robert Worth at $5\frac{1}{2}$%, principal and interest payable one year after date. (a) What will be the amount of the interest on the loan? (b) What is the total amount that Dexter must pay Worth when the loan is due?

2. To start a radio repair business, Warren Stewart borrowed \$675 from his brother, Jack. He repaid the principal with interest $2\frac{1}{2}$ years later at 4%. How much did Warren pay his brother?

3. At the beginning of her last year in college, Lois Jacobs borrowed \$750 from her aunt in order to complete her college course. If she repaid the loan $3\frac{1}{2}$ years later with interest at 5%, how much did the aunt receive from Lois?

4. In order to pay an emergency hospital bill, Floyd Mason borrowed \$450 at $4\frac{1}{2}\%$ from a business associate. He repaid the loan 8 months later. How much did he have to pay?

> Unless otherwise specified, a month is considered to be one twelfth of a year. Therefore the interest for 8 months is $\frac{8}{12}$, or $\frac{2}{3}$, of the interest for one year.

5. In order to pay his property taxes on time and avoid a penalty, Louis Hart, a homeowner, borrows \$220 by signing a 9-month note bearing interest at the rate of 5%. What is the total amount that he must pay on the date of maturity?

6. A man gave a 5-month note for \$680 with interest at $5\frac{1}{4}\%$. How much will he be required to pay when the note is due? (Calculate the interest to the nearest cent.)

INTEREST

Nature of Interest. *Interest* is the amount that is charged for the use of another person's money. It represents an expense to the person who borrows the money and pays the interest. It represents an income to the person who lends the money and receives payment of the interest.

Terms Used in Interest. If you borrow for a year's time \$1,000 at 6%, you pay interest amounting to \$1,000 × .06, or \$60. The amount borrowed, \$1,000, is known as the *principal.* The per cent, 6%, is called the *rate of interest,* or simply the *rate.* The period for which the money is borrowed, one year, is the *time.* The \$60 that you pay for the use of the \$1,000 is the *interest.* The sum of the principal and the interest, \$1,060, is often referred to as the *amount.*

Unless expressly stated to the contrary, the rate of interest is always understood to be an *annual rate.* The rate therefore indicates what per cent of the principal is charged for the use of the money for *one year.*

Interest Formulas. The rate of interest is always based on the principal. Therefore the principal is multiplied by the rate to find the amount of the interest. Since the rate of interest is an annual rate, the product of the principal and the rate gives the interest for one year. Hence the formula:

Principal × Rate = Interest for 1 year

Interest for a period of time other than one year may be found by multiplying the interest for 1 year by the time expressed in years. In other words, the interest for any period of time is equal to the principal multiplied by the rate multiplied by the time in years. Expressed as a formula:

Principal × Rate × Time = Interest

Thus, if you borrow $1,000 at 6% for 3 years, the interest will be $180, computed as follows:

$\$1,000 \times .06 \times 3 = \$180$, int. for 3 yr.

Similarly, if you borrow $1,000 at 6% for a period of time equivalent to $\frac{1}{5}$ of a year, the interest will be $12.

$\$1,000 \times .06 \times \frac{1}{5} = \$12$, int. for $\frac{1}{5}$ yr.

Exercise 2. (*Oral*)

State the interest on:

1. $400 @ 6% for 1 yr.
2. $200 @ 6% for 3 yr.
3. $300 @ 6% for $\frac{1}{2}$ yr.
4. $200 @ 6% for $1\frac{1}{2}$ yr.
5. $400 @ 6% for $\frac{1}{4}$ yr.
6. $800 @ 5% for 1 yr.
7. $400 @ 3% for 2 yr.
8. $200 @ $5\frac{1}{2}$% for 1 yr.
9. $100 @ $4\frac{1}{2}$% for 2 yr.
10. $200 @ 4% for $1\frac{1}{2}$ yr.

Interest for Periods of Time Expressed in Days or Months. In order to simplify the interest calculations when the time is expressed in days or months, it is common business practice to compute the interest on the basis of a 360-day year, often referred to as the *commercial year*, which is divided into 12 months of 30 days each.

Under this plan, the interest for 30 days is $\frac{30}{360}$, or $\frac{1}{12}$, of the interest for 1 year; the interest for 60 days is $\frac{60}{360}$, or $\frac{1}{6}$, of the interest for 1 year; and so on.

Thus, since 72 days is $\frac{72}{360}$, or $\frac{1}{5}$, of a year, the computation of the interest on $1,000 at 6% for 72 days will be:

$\$1,000 \times .06 \times \frac{1}{5} = \$60 \times \frac{1}{5} = \$12$, int. for 72 da.

Similarly, since 4 months is $\frac{4}{12}$, or $\frac{1}{3}$, of a year, the interest on $900 at 6% for 4 months will be:

$\$900 \times .06 \times \frac{1}{3} = \$54 \times \frac{1}{3} = \$18$, int. for 4 mo.

Exercise 3. (Written)

Find the interest to the nearest cent on:

1. $275 @ 6% for 60 da.
2. $335 @ 2% for 3 mo.
3. $255 @ 7% for 90 da.
4. $370 @ 1½% for 6 mo.
5. $250 @ 5% for 4 mo.
6. $430 @ 3½% for 120 da.
7. $680 @ 3% for 1 mo.
8. $920 @ ¾% for 180 da.

To Find the Rate of Interest. If the interest for 1 year and the principal are known, the rate of interest can be found by dividing the interest by the principal.

$$\textbf{Rate of Interest} = \frac{\textbf{Interest for 1 yr.}}{\textbf{Principal}}$$

If the interest given in the problem is for a period other than a year, first find how much the interest would be for one year; then divide this interest by the principal.

For example, James Cooper paid $10 interest on a loan of $800 for 90 days. The interest charge of $10 for 90 days (¼ of a year) is equivalent to $10 × 4 ($10 ÷ ¼), or $40 interest for one year. Hence, the rate of interest he paid was 5%.

$$\frac{\$40}{\$800} = .05 = 5\%$$

Exercise 4. (Written)

Find the rate of interest in each of the following:

PRINCIPAL	TIME	INTEREST	PRINCIPAL	TIME	INTEREST
1. $300	60 da.	$2.00	7. $60	10 mo.	$3.00
2. $600	30 da.	$2.50	8. $150	8 mo.	$4.00
3. $400	90 da.	$3.00	9. $200	9 mo.	$4.50
4. $120	2 mo.	$1.40	10. $240	15 mo.	$6.00
5. $200	6 mo.	$4.50	11. $300	18 mo.	$22.50
6. $700	3 mo.	$3.50	12. $75	20 mo.	$10.00

Problems for Application and Review

Group A

1. (a) Using the four-step process, multiply 13⅔ by 7⅙. (b) 168 is ⅜ of what number? (c) Express ¾% as a decimal. (d) Find the

amount that is 37½% less than $18.80. (e) $14.70 is 87½% of what amount? (f) Express 4¾% as a decimal.

2. A wholesale company borrowed $2,850 for 3 years at 5½% interest. What was the total amount of interest that it paid during the 3 years?

3. C. M. Wood paid $3 interest on a loan of $450 for 60 days. What rate of interest did he pay?

4. An agency collected 75% of a claim of $1,200 and charged 10% for its services. How much commission did the agency receive?

5. How much should a salesman sell in a year to yield him a commission of $3,500 if the rate of commission is 5% on all sales?

6. A worker is paid a regular wage of $1.48 an hour for 8 hours a day from Monday through Friday with time and a half for overtime on these days and double time for work on Saturday and Sunday. During one week he worked nine hours each day, Monday through Sunday. Find his total earnings for the week.

Group B

1. (a) Using the four-step process, multiply 25⅓ by 4⅚. (b) What amount is ⅝ of $12.40? (c) Express ⅛% as a decimal. (d) 16⅔% of $45.90 is what amount? (e) $3.60 is 75% of what amount? (f) Express 3¾% as a decimal.

2. A man borrowed $1,750 for 3 years at 4½% interest. What was the total amount of interest paid during the 3 years?

3. The cost of the interest on a loan of $900 for 60 days is $7.50. What is the rate of interest?

4. A salesman is paid a regular monthly salary of $195, plus a commission on all sales in excess of $3,000 in any single month. Last month his total sales were $5,680 and his total earnings $396. What per cent commission did he receive?

5. Hill, a salesman, received a salary of $200 a month, a 1% commission on all his sales, and an additional commission of 2% on all monthly sales in excess of $6,000. His sales for January were $12,000, February $9,000, and March $14,800. What was his average monthly income during the three months?

Section 2 . . . Borrowing on a Promissory Note (Concluded)

Determining the Date of Maturity When the Time Is in Months. When the time of a note is expressed in months, the date of maturity is found by counting forward, from the date of the note, the number of months stated in the time. The date of maturity is the same date in the month of maturity as the date on the note, provided the month of maturity has such a date. If it does not, the date of maturity is the last date in the month of maturity.

Example 1: Find the date of maturity of a 3-mo. note dated March 28.

Solution	*Explanation*
March 28 + 3 mo. = June 28 *Ans. June 28*	The date of the note is March 28. The month of maturity is June, the third month after March. The date of maturity is therefore June 28.

Example 2: Find the date of maturity of a 3-mo. note dated March 31.

Solution	*Explanation*
March 31 + 3 mo. = June 30 *Ans. June 30*	The date of the note is March 31. The month of maturity is June, the third month after March. Since there is no such date as June 31, the date of maturity is June 30, the last date in June.

Exercise 5. (*Oral*)

State the date of maturity of each of the following notes.

	Date of Note	Time		Date of Note	Time		Date of Note	Time
1.	May 10	1 mo.	**5.**	Jan. 31	2 mo.	**9.**	Nov. 30	2 mo.
2.	June 1	3 mo.	**6.**	Jan. 31	3 mo.	**10.**	Nov. 30	3 mo.
3.	Aug. 25	2 mo.	**7.**	Mar. 31	3 mo.	**11.**	Dec. 29	1 mo.
4.	Jan. 31	1 mo.	**8.**	Nov. 30	1 mo.	**12.**	Dec. 29	2 mo.

Determining the Date of Maturity When the Time Is in Days. When the time is expressed in days, the date of maturity is found by counting forward, from the date of the note, the number of days stated in the time.

Example: Find the date of maturity of a 90-day note dated March 28.

Solution	*Explanation*
90 da. *March 3* *87*	3 da. are left in March after March 28, the date of the note. Subtract 3 da. from 90 da., leaving 87 da. to carry forward through April.
April 30 *57*	Subtract 30 da. for April, leaving 57 da. to carry forward through May.
May 31 *June 26* *Ans. June 26*	Subtract 31 da. for May, leaving 26 da. to carry forward into June. The date of maturity is therefore June 26.

The accuracy of the subtraction in the foregoing solution may be checked by adding the number of days used in each of the four months. Thus, 3 da. in March + 30 da. in April + 31 da. in May + 26 da. in June = 90 da., the time of the note.

Exercise 6. (*Written*)

Find the date of maturity of each of the notes indicated below.

Date of Note	Time	Date of Note	Time	Date of Note	Time
1. Oct. 1	90 da.	**4.** Aug. 22	60 da.	**7.** Dec. 20	60 da.
2. May 6	60 da.	**5.** May 29	45 da.	**8.** Aug. 16	90 da.
3. Nov. 12	90 da.	**6.** July 15	90 da.	**9.** Nov. 17	60 da.

INTEREST (*Continued*)

The 60-Day Method of Calculating Interest at 6%. Sixty days, or 2 months, is $\frac{1}{6}$ of a 360-day year. Therefore, if the interest rate is 6% a year, the rate for 60 days is $\frac{1}{6}$ of 6%, or 1%. Hence, interest at 6% for 60 days (or 2 months) may be found by multiplying the principal by 1%, or .01; in other words, by pointing off two places in the principal. To illustrate:

Int. on \$300 at 6% for 60 da. (2 mo.) = \$3

Rule for Finding Interest at 6% for 6, 60, 600, or 6,000 Days. As shown above, interest at 6% for 60 days can be found by pointing off two decimal places in the principal. That is, the interest for 60 days is .01 of the principal. Since 6 days is $\frac{1}{10}$ of 60 days, it is obvious that the interest for 6 days is .001 of the principal. Also, since 600 days is 10 times 60 days, the interest for 600 days is .1 of the principal. We may therefore formulate the following general rule:

To find the interest at 6% on any sum of money for:

6 da., point off 3 places in the principal
60 da., " " 2 " " " "
600 da., " " 1 " " " "
6,000 da., " " no " " " "

Exercise 7. (*Oral*)

State the interest at 6% on:

	1.	**2.**	**3.**
a.	$450 for 6 da.	$165 for 6,000 da.	$270 for 60 da.
b.	$320 for 60 da.	$145 for 60 da.	$310 for 6,000 da.
c.	$1,800 for 6 da.	$315 for 2 mo.	$170 for 2 mo.
d.	$740 for 600 da.	$850 for 6 da.	$85 for 600 da.
e.	$230 for 2 mo.	$225 for 600 da.	$190 for 6 da.

To Find Interest for Multiples of 6, 60, or 600 Days. When the number of days is a multiple of 6, 60, or 600 days, multiply the interest for 6, 60, or 600 days by 2, 3, or 4, etc., as the case may be.

Example: Find the interest at 6% on $375.80 for 24 days.

Solution	*Explanation*
$.3758 = int. for 6 da. *4 × $.3758 = $1.5032* *Ans. $1.50*	Since 24 days is 4 times 6 days, the interest for 24 days is 4 times the interest for 6 days.

Exercise 8. (*Oral*)

State the interest at 6% on:

1.	**2.**	**3.**
$250 for 12 da.	$130 for 180 da.	$80 for 42 da.
$400 for 18 da.	$150 for 36 da.	$70 for 360 da.
$700 for 24 da.	$500 for 48 da.	$350 for 1,200 da.
$350 for 120 da.	$120 for 240 da.	$160 for 1,800 da.

To Find Interest for Aliquot Parts of 6, 60, or 600 Days. When the number of days is an aliquot or fractional part of 6, 60, or 600 days, multiply the interest for 6, 60, or 600 days, as the case may be, by the fraction that represents the part.

Example: Find the interest on $739.60 for 15 da. at 6%.

Solution	*Explanation*
\$7.396 = int. for 60 da. $\frac{1}{4}$ × *\$7.396 = \$1.849* *Ans. \$1.85*	Since 15 days is $\frac{1}{4}$ of 60 days, the interest for 15 days is $\frac{1}{4}$ of the interest for 60 days.

The frequently used aliquot and fractional parts of 6, 60, and 600 days are shown in the following table.

FRACTIONAL PARTS OF 6, 60, AND 600 DAYS

	$\frac{1}{10}$	$\frac{1}{6}$	$\frac{1}{5}$	$\frac{1}{4}$	$\frac{1}{3}$	$\frac{1}{2}$	$\frac{2}{3}$	$\frac{3}{4}$	$\frac{5}{6}$
6 da.		1			2	3	4		5
60 da.	6	10	12	15	20	30	40	45	50
600 da.	60	100	120	150	200	300	400	450	500

Exercise 9. (Oral)

State the interest at 6% on:

1. $1,200 for 1 da.
2. $900 for 2 da.
3. $840 for 3 da.
4. $1,800 for 4 da.
5. $2,400 for 5 da.
6. $240 for 10 da.
7. $350 for 12 da.
8. $280 for 15 da.
9. $270 for 20 da.
10. $320 for 30 da.
11. $210 for 40 da.
12. $160 for 45 da.
13. $360 for 50 da.
14. $72 for 100 da.
15. $55 for 120 da.
16. $80 for 150 da.
17. $120 for 200 da.
18. $140 for 300 da.

Problems for Application and Review

Group A

1. (a) Find the due date of a 90-day note dated May 17. (b) What number divided by $2\frac{3}{4}$ gives 42? (c) Find the due date of a

3-month note dated May 31. (d) Divide 850 by $5\frac{2}{3}$. (e) Express $2\frac{1}{4}\%$ as a decimal. (f) $5.89 is 5% less than what amount?

2. Find (a) the due date and (b) the amount due at maturity on a 60-day note for $375, dated March 8, and bearing interest at 6%.

3. If the interest on a loan of $5,850 for 90 days is $87.75, what is the rate of interest?

4. Hilton borrowed $1,380 for $2\frac{1}{2}$ years at 5% interest. What was the total amount of interest he paid during the $2\frac{1}{2}$ years?

5. For the first five months of the year a salesman's monthly sales were $4,750, $5,580, $6,120, $5,800, and $5,175, respectively. What must be the amount of his sales for the sixth month in order that his monthly average for the six months may be $5,500?

6. Pupil registration in the Wakefield school was 784 last year and 896 the year before. What was the per cent increase or decrease in pupil registration?

7. Three years ago an office employee was receiving an annual salary of $3,000. On January 1 of each year since that time, he has received a 10% increase. What is his present salary?

Group B

Thurs

1. (a) Express $4\frac{1}{4}\%$ as a decimal. (b) Find the due date of a 6-month note dated August 30. (c) $25.44 is 4% less than what amount? (d) Find the due date of a 90-day note dated March 15. (e) Divide 495 by $11\frac{1}{4}$. (f) Multiply 78 by $4\frac{1}{6}$.

2. Find (a) the due date and (b) the amount due at maturity on a 120-day, 6% note for $585, dated June 29.

3. What is the rate of interest charged on a loan of $720 for 90 days if the amount of the interest charge is $8.10?

4. An agency that charges 10% commission collected 60% of a debt of $900. How much commission did the agency retain?

5. A salesman receives a salary of $150 a month and a commission of 4% on all sales. What must be the amount of his sales each month in order that his total monthly income may be $400?

6. A salesman's sales for January of last year were $5,460 and for January of this year, $6,370. Find the per cent increase or decrease in his January sales.

Section 3 . . . Borrowing from a Bank

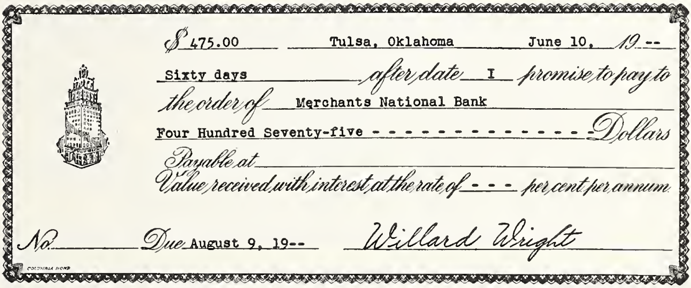
Sources of Loans. Persons who are in need of additional funds may in some instances borrow from relatives or friends. The more common practice, however, is to borrow from a bank, a credit union, a loan company, or some other agency that is in the business of lending money.

An Individual Applying at a Bank for a Loan

Borrowing from a Bank. One of the chief functions of a commercial bank is lending money to its depositors who wish to borrow and who can give satisfactory evidence that the amount borrowed will be repaid as promised. If a depositor is well known at the bank, has established a reputation of honesty and promptness in meeting his financial obligations, owns property, and has a regular income, he can usually obtain a small loan at his bank merely by signing a promissory note.

The majority of such loans are made for only short periods of time, usually not exceeding 90 days, and are known as *short-term loans.* If the money is needed for a longer period, the borrower may renew the loan at maturity by signing a new note. The money from the new loan is used to pay the old note. Frequently the borrower pays a part of the principal at maturity, and signs a new note for the balance.

Bank Discount. When a bank makes a short-term loan, the borrower is usually required to pay the interest in advance, at the time the loan is granted. Since the interest is paid in advance, the note that the borrower signs does not have to include any statement about interest. The note in that case is said to be without interest; that is, *non-interest-bearing.* The following illustration shows the non-interest-bearing note that Willard Wright signed in obtaining a 60-day loan at the Merchants National Bank.



$475.00 Tulsa, Oklahoma June 10, 19--
Sixty days after date I promise to pay to
the order of Merchants National Bank
Four Hundred Seventy-five - - - - - - - - - - - - - Dollars
Payable at
Value received with interest at the rate of - - - per cent per annum
No. Due August 9, 19-- Willard Wright

Non-Interest-Bearing Note

When interest is collected in advance, the bank computes the interest and deducts it from the face of the note. The amount of money that the borrower receives is the face of the note less the interest charge.

Interest collected in advance in this manner is called *discount.* The rate of interest charged by the bank is referred to as the *rate of discount,* or *discount rate.* The amount of money that the borrower receives is called the *proceeds.* The loan in such cases is said to be granted, or obtained, by *discounting* the borrower's note.

If the rate of discount at the Merchants National Bank is 6%, the bank discount on Willard Wright's note, shown above, would be $4.75. The proceeds he receives would be $470.25, as shown by the following calculations:

Face of note	$475.00
Discount	4.75
Proceeds	$470.25

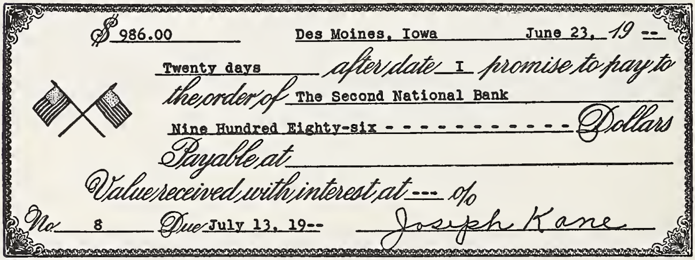
On August 9, the date of maturity, Willard Wright will discharge the debt by paying the bank $475, the amount of the face of the note.

Exercise 10. (*Written*)

1. On May 19, Walter Ross obtained a loan at the Essex National Bank by discounting his 60-day note for $545, dated May 19. The discount rate was 6%. (a) Find the amount of the proceeds Mr. Ross received. (b) On what date did the note become due? (c) What amount did he have to pay the bank on that date?

2. On October 27, the Elsmere Trust Company discounted Fred Jordan's 30-day note for $675, dated October 27, and gave him the proceeds. (a) What amount of proceeds did Mr. Jordan receive? (When the rate of discount is not given, assume that it is 6%.) (b) What was the due date of the note?

3. The following note was discounted on June 23 by Joseph Kane at the Second National Bank. Find the proceeds.



$986.00 Des Moines, Iowa June 23, 19--

Twenty days after date I promise to pay to

the order of The Second National Bank

Nine Hundred Eighty-six - - - - - - - - - - - Dollars

Payable at

Value received with interest at --- %

No. 8 Due July 13, 19-- Joseph Kane

4. On March 28, the Phoenix Bank and Trust Company discounted Leopold Wilder's 15-day note for $1,275, dated March 28, and credited the proceeds to Mr. Wilder's checking account. (a) What amount was credited to his account? (b) What was the due date of the note?

INTEREST (*Continued*)

To Find Interest for Any Number of Days. By combining the interest for various aliquot parts and multiples of 6, 60, or 600 days, the interest for any number of days may be found readily.

For example, the interest for 7 da. is equivalent to the interest for 6 da. + 1 da.; the interest for 8 da. is equivalent to the interest for 6 da. + 2 da.; the interest for 67 da. is equivalent to the interest for 60 da. + 6 da. + 1 da.; and so on.

There are several different types of combinations that may be used in building up the interest for the number of days required in a problem. Examples of each type of combination are given below and on the pages that follow.

Combinations Involving 6 Days and Aliquot Parts of 6 Days. The most frequently used combinations of 6 days and aliquot parts of 6 days are the following:

7 da. = 6 + 1
8 da. = 6 + 2
9 da. = 6 + 3
12 da. = 6 + 6
13 da. = 6 + 6 + 1
14 da. = 6 + 6 + 2

Example: Find the interest at 6% on $1,352.80 for 67 da.

Solution

	$13	*5280 = int. for 60 da.**
6)	*1*	*3528 = int. for 6 da.*
		2255 = int. for 1 da.
	$15	*1063 = int. for 67 da.*

Ans. $15.11

Explanation

67 da. = 60 da. + 6 da. + 1 da. Write the interest for 60 da. Draw a vertical line to take the place of the decimal point. Write the interest for 6 da. Divide the interest for 6 da. by 6 to find the interest for 1 da. Add the interest for 60 da., 6 da., and 1 da. to find the interest for 67 da.

*All calculations should be carried correct to 4 decimal places to insure accuracy in the cents column. The final result is rounded to the nearest cent.

Exercise 11. (*Oral*)

State the interest at 6% on:

1. $180 for 7 da.
2. $150 for 8 da.
3. $260 for 9 da.
4. $330 for 8 da.
5. $660 for 7 da.
6. $7,000 for 9 da.
7. $480 for 7 da.
8. $2,400 for 9 da.
9. $2,700 for 8 da.

Exercise 12. (*Written*)

Find the interest at 6% on:

1. $314.50 for 67 da.
2. $627.76 for 68 da.
3. $826.38 for 69 da.
4. $942.60 for 7 da.
5. $818.50 for 8 da.
6. $943.65 for 9 da.
7. $818.15 for 12 da.
8. $976.87 for 13 da.
9. $487.55 for 14 da.

Combinations of 60 Days and an Aliquot Part of 60 Days. The following are the most frequently used combinations of 60 days and an aliquot part of 60 days.

66 da. = 60 + 6
70 da. = 60 + 10
72 da. = 60 + 12
75 da. = 60 + 15
80 da. = 60 + 20
90 da. = 60 + 30

Exercise 13. (*Oral*)

State the interest at 6% on:

1. $350 for 66 da.
2. $420 for 70 da.
3. $150 for 72 da.
4. $320 for 75 da.
5. $210 for 80 da.
6. $160 for 90 da.
7. $250 for 72 da.
8. $360 for 80 da.
9. $84 for 70 da.
10. $180 for 90 da.
11. $160 for 75 da.
12. $480 for 90 da.

Exercise 14. (*Written*)

Find the interest at 6% on:

1. $1,345 for 66 da.
2. $1,489 for 70 da.
3. $965 for 75 da.
4. $1,435 for 80 da.
5. $1,276 for 90 da.
6. $985 for 70 da.
7. $2,150 for 90 da.
8. $3,265 for 75 da.
9. $5,275 for 80 da.

Problems for Application and Review

Group A

Mon **1.** (a) Find the interest at 6% on $1,142.75 for 7 days. (b) Find the due date of a 4-month note dated April 30. (c) $1,472 is 8% smaller than what amount? (d) $1.80 is $83\frac{1}{3}\%$ of what amount? (e) Express $\frac{2}{5}\%$ as a decimal.

2. On March 25, W. E. Scott discounted at the bank at 6% his 60-day non-interest-bearing note for $325, dated March 25. Find (a) the proceeds of the note, (b) the date of maturity, and (c) the amount Scott must pay the bank at maturity.

3. Find (a) the due date and (b) the amount due at maturity on a 90-day, 6% note for $925.50, dated October 8.

4. Jason borrowed $1,500 for 3 years and 6 months at $4\frac{1}{2}\%$ interest. What was the total amount of interest he paid during that time?

5. B. M. Rice, salesman, received a monthly salary of $220 and a commission on all sales. What rate of commission did he receive on last year's sales of $38,500 if his total earnings for the year, including both salary and commission, were $4,565?

Group B

Tues

1. (a) Express 38⅛% as a decimal. (b) Find the interest at 6% on $1,381.70 for 8 days. (c) Find the due date of a 4-month note dated July 31. (d) $37.40 is 15% smaller than what amount? (e) Express ⅜% as a decimal.

2. On July 22, C. J. Park discounted at the bank at 6% his 60-day non-interest-bearing note for $650, dated July 22. Find (a) the proceeds of the note and (b) the due date of the note.

3. Find (a) the date of maturity and (b) the amount due at maturity on a 90-day, 6% note for $248.85, dated April 30.

4. If $1.25 interest is charged on a loan of $300 for 30 days, what is the rate of interest?

5. For selling a piece of property, a real estate agent received $1,351 commission. If his commission rate was 3½%, what was the selling price of the property?

Group C

Wed.

1. (a) Find the interest at 6% on $835.50 for 70 days. (b) $197.80 is 115% of what amount? (c) What per cent of 125 is 200? (d) What amount increased by 66⅔% of itself gives $196.50? (e) Express 110⅛% in decimal form.

2. A 30-day note for $450, bearing interest at 6%, is dated July 12. (a) What is the due date of the note? (b) What is the total amount due on the due date?

3. What rate of interest is charged if the cost of the interest on a loan of $900 for 30 days is $5.25?

4. Walter Morse sold a house and lot through a real estate agent who charged 6% commission. His net proceeds, after paying the agent's commission, amounted to $9,635. What was the sale price of the house and lot?

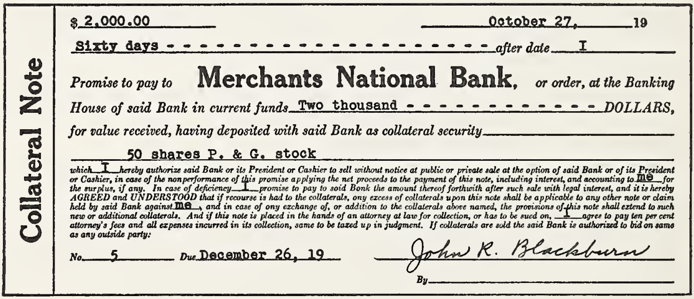
5. On June 1, James Scribner received his bank statement, which showed a bank balance of $127.89. His checkbook balance on that date was $82.50. On comparing the statement with the checkbook, Scribner found that the following items had not been recorded in the checkbook: a canceled check for $15.92; a deposit of $21.36; a service charge of $1. The following checks were outstanding: $20.00; $4.95; $16.00. Prepare a reconciliation statement.

Collateral Loans. If the applicant for a loan does not have satisfactory financial standing at the bank, the bank will require him to pledge some form of property as a guarantee that the loan will be paid at maturity. A loan made in this manner is known as a *secured loan*, or *collateral loan;* and the property pledged is referred to as *collateral.* When the loan is repaid as agreed, the collateral is returned to the borrower.

Kinds of Property Used as Collateral. The most common forms of property used as collateral are bonds, stocks, and life insurance policies.

Ordinarily, a bank will lend about 50 to 75 per cent of the value of a good bond or good stock. On a life insurance policy, a loan equal to the cash surrender value of the policy can usually be obtained, either from a bank or from the insurance company that issued the policy.

Collateral Notes. When collateral is pledged as security for a loan, the note that the borrower signs is called a *collateral note.* A typical collateral note is shown below.



Collateral Note

$2,000.00 October 27, 19

Sixty days - *after date* I

Promise to pay to **Merchants National Bank,** *or order, at the Banking House of said Bank in current funds* Two thousand - - - - - - - - - - - - - *DOLLARS,*

for value received, having deposited with said Bank as collateral security

50 shares P. & G. stock

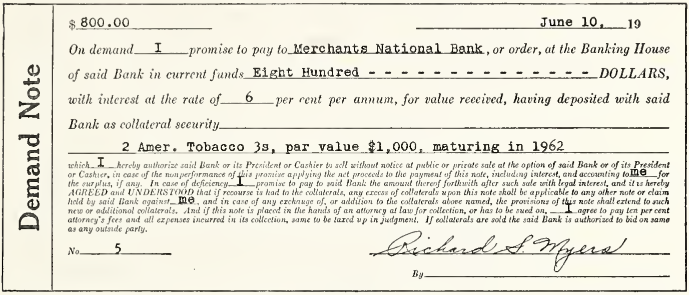
which I *hereby authorize said Bank or its President or Cashier to sell without notice at public or private sale at the option of said Bank or of its President or Cashier, in case of the nonperformance of this promise applying the net proceeds to the payment of this note, including interest, and accounting to* me *for the surplus, if any. In case of deficiency* I *promise to pay to soid Bonk the amount thereof forthwith after such sale with legal interest, and it is hereby AGREED and UNDERSTOOD that if recourse is had to the collaterals, ony excess of collaterals upon this note shall be applicable to any other note or claim held by said Bank against* me*, and in case of ony exchange of, or addition to the collaterals above named, the provisions of this note shall extend to such new or additional collaterals. And if this note is placed in the hands of an attorney at law for collection, or has to be sued on,* I *agree to pay ten per cent attorney's fees and all expenses incurred in its collection, same to be taxed up in judgment. If collaterals are sold the said Bank is authorized to bid on same as any outside party:*

No. 5 *Due* December 26, 19 John R. Blackburn

By

Collateral Note

Demand Notes. Ordinarily a bank loan is made for a definite period of time, such as 30, 60, or 90 days, and becomes due at the expiration of the time stated on the note. Collateral loans are often made payable "on demand" rather than at the expiration of a fixed period of time. A loan of this type is called a *demand loan,* and the note that the borrower signs is called a *demand note.* A demand note is always interest-bearing. A typical demand note is shown in the following illustration.



Demand Note

$ 800.00 June 10, 19

On demand I *promise to pay to* Merchants National Bank*, or order, at the Banking House of said Bank in current funds* Eight Hundred - - - - - - - - - - - - - - - *DOLLARS, with interest at the rate of* 6 *per cent per annum, for value received, having deposited with said Bank as collateral security*

2 Amer. Tobacco 3s, par value $1,000, maturing in 1962

which I *hereby authorize said Bank or its President or Cashier to sell without notice at public or private sale at the option of said Bank or of its President or Cashier, in case of the nonperformance of this promise applying the net proceeds to the payment of this note, including interest, and accounting to* me *for the surplus, if any. In case of deficiency* I *promise to pay to said Bank the amount thereof forthwith after such sale with legal interest, and it is hereby AGREED and UNDERSTOOD that if recourse is had to the collaterals, any excess of collaterals upon this note shall be applicable to any other note or claim held by said Bank against* me*, and in case of any exchange of, or addition to the collaterals above named, the provisions of this note shall extend to such new or additional collaterals. And if this note is placed in the hands of an attorney at law for collection, or has to be sued on,* I *agree to pay ten per cent attorney's fees and all expenses incurred in its collection, same to be taxed up in judgment. If collaterals are sold the said Bank is authorized to bid on same as any outside party.*

No 5

Richard S. Myers

By

Demand Note

A demand loan becomes payable at any time the bank chooses to demand payment. The borrower, on the other hand, has the right to pay the loan at any time before the demand is made. A demand loan is convenient to the borrower when he cannot determine in advance exactly how long he will need the use of the money.

Demand loans are usually made with the understanding that the interest shall be paid at stated intervals. Many banks specify that the interest shall be paid every three months. Sometimes, when the interest is paid, an extra amount is paid to apply against the principal. In cases where payments are made in this manner to reduce the principal, the interest due on subsequent interest dates is based upon the unpaid balance at the time the interest payment is made.

To Find the Amount Due on the Date of Settlement of a Demand Note. When payment of a demand note is made, the amount due is the face of the note plus interest on the face from the date of the note, or the date of the last interest payment, to the date of settlement. Thus the amount due on July 25 in full payment of a 6% demand note for $800, dated June 10, would be $806.

Face of note	$800
Int. on $800—June 10 to July 25 (45 da.)	6
Amount due on July 25	$806

To Find the Number of Days Between Two Dates. In finding the amount due on the date of settlement of a demand note, it is necessary to find the number of days from the date of the note, or the date of the last interest payment, to the date of settlement. The method of counting the exact number of days between two dates is shown in the solution of the following example.

Example: Find the exact number of days from July 20 to October 15.

Solution		*Explanation*
	31 *−20*	Since there are 31 days in July, there are 11 days left in July after July 20 (31 − 20 = 11).
July *August*	*11* *31*	There are 31 days in August, 30 in September, and 15 in October.
September *October*	*30* *15*	Adding 11, 31, 30, and 15 gives 87, the number of days from July 20 to October 15.
	87	

Exercise 15. (*Written*)

1. Find the number of days from:

a. Mar. 23 to May 4
b. June 14 to Aug. 11
c. Oct. 4 to Dec. 5
d. Jan. 19 to April 7
e. May 10 to Aug. 2
f. July 25 to Oct. 25

2. On August 30, Homer Miller obtained a loan at the Salina National Bank by signing a demand note for $840, dated August 30, bearing interest at 6%. On November 6 he made full payment of the note and interest. How much did he pay the bank on November 6?

3. Vincent Huston obtained a loan of $1,175 at his bank by giving his demand note for $1,175, dated April 27, with interest at 6%. If he made full settlement of the note on July 10, how much was he required to pay the bank on that date?

4. A demand note for $925, dated June 25, with interest, was settled in full on August 31. What was the amount due on the date of settlement?

When the rate of interest on an interest-bearing note is not specified, assume that the rate is 6%.

5. Robert Dewey borrowed $1,200 at his bank on a demand note dated January 15, with interest. On April 15 he paid the interest to date and made a payment of $325 on the principal. On June 23 he made final settlement of the balance due including the interest. How much was required to settle the note on June 23?

Real Estate Mortgages. If a person who owns improved real estate, such as a home, needs to borrow a relatively large sum for a long period of time, he can usually obtain the loan by signing a note, sometimes called a *bond*, and giving the lender a *mortgage* on the property. The mortgage serves as security for the payment of the loan. It gives the lender the right to take possession of the property if payments of the interest and principal are not made in accordance with the terms of the agreement.

Payment of the Interest and Principal. The mortgage agreement usually provides that the interest shall be paid at stated periods, such as monthly, quarterly, semiannually, or yearly. It may also provide that a stated additional amount shall be paid on each interest date to apply against the principal. In some mortgages payments on the principal are not required; the full amount is payable on the due date. In others, the borrower may be given the privilege of paying a part or all of the principal on any interest date before the date of final settlement. When payments are made in this manner to reduce the principal, the interest due on subsequent interest dates is based upon the unpaid balance at the time the interest payment is made, not upon the original principal.

Exercise 16. (*Written*)

1. A mortgage amounting to $2,220 bears interest at 5%, payable semiannually. What amount of interest is due on each interest date?

> To find the amount of interest due on the interest date of a mortgage, take $\frac{1}{12}$ of the interest for one year if the interest is payable monthly, $\frac{1}{4}$ if it is payable quarterly, or $\frac{1}{2}$ if it is payable semiannually.

2. A mortgage amounting to $3,800 bears interest at 4½%, payable quarterly. What amount of interest is due on each interest date?

3. A mortgage amounting to $3,000 requires a quarterly payment of $50 on the principal. (a) What will be the amount of the unpaid principal at the beginning of the second quarter? (b) At the beginning of the third quarter? (c) At the beginning of the fourth quarter?

4. On February 1, Albert Milburn placed a $3,000 mortgage at 6% on his home. The mortgage agreement requires quarterly payment of interest, together with a payment of $50 on the principal. (a) How much interest will be due on May 1, the end of the first quarter?* (b) What total amount will Mr. Milburn be required to pay on May 1? (c) How much interest will be due on August 1, the end of the second quarter? (d) What total amount will he be required to pay on August 1? (e) How much interest will be due on November 1, the end of the third quarter? (f) What total amount will he be required to pay on November 1?

*Interest for the first quarter is based on the original amount of the principal; interest for the second quarter is based on the unpaid balance at the beginning of the second quarter; interest for the third quarter is based on the unpaid balance at the beginning of the third quarter; and so on.

5. On March 1, Frank Lane placed a $2,500 mortgage at 4% on his home. The mortgage agreement required the quarterly payment of interest, together with a payment of $100 on the principal. (a) What total amount was Mr. Lane required to pay at the end of the first quarter? (b) At the end of the second quarter? (c) At the end of the third quarter?

INTEREST (*Continued*)

Combinations of Aliquot Parts of 60 Days and 6 Days. There are numerous combinations that may be made with aliquot parts of 60 days and 6 days. The following examples are suggestive:

16 da. = 10 + 6
21 da. = 15 + 6
27 da. = 15 + 6 + 6
36 da. = 30 + 6
37 da. = 30 + 6 + 1
40 da. = 20 + 20

Example: Find the interest at 6% on $469.75 for 19 da.

Solution

6)$4	*6975 int. for 60 da.*
	7829 int. for 10 da.
2)	*4698 int. for 6 da.*
	2349 int. for 3 da.
$1	*4876 int. for 19 da.*

Ans. $1.49

Explanation

19 da. = 10 + 6 + 3

Write the interest for 60 da. Since the number of days in the problem is less than 60, draw a line under the interest for 60 da. to indicate that it is not to be added to the subsequent interests.

Divide the interest for 60 da. by 6 to find the interest for 10 da. Move the decimal point one place to the left in the interest for 60 da. to find the interest for 6 da. Divide the interest for 6 da. by 2 to find the interest for 3 da. Add the interest for 10 da., 6 da., and 3 da. to find the interest for 19 da.

Exercise 17. (Written)

Find the interest at 6% on:

	1.	**2.**	**3.**
a.	$482.75 for 16 da.	$312.47 for 37 da.	$318.25 for 29 da.
b.	$587.30 for 21 da.	$806.40 for 38 da.	$728.27 for 49 da.
c.	$731.45 for 27 da.	$832.49 for 40 da.	$731.20 for 72 da.
d.	$673.87 for 26 da.	$628.50 for 46 da.	$320.10 for 76 da.
e.	$720.30 for 32 da.	$428.48 for 52 da.	$712.80 for 81 da.
f.	$321.50 for 36 da.	$218.38 for 19 da.	$208.14 for 86 da.

Problems for Application and Review

Group A

1. (a) Express $122\frac{3}{8}\%$ in decimal form. (b) Find the interest at 6% on $762.14 for 16 days. (c) Find the number of days from March 28 to June 1. (d) What amount decreased by 12% of itself gives $22.44? (e) Express $3\frac{1}{2}\%$ as a decimal.

2. A demand note for $575, dated March 27, was settled in full on June 10, with interest at 6%. What was the amount due on the date of settlement?

3. A mortgage amounting to $7,800 bears interest at $4\frac{1}{2}\%$, payable quarterly. What amount of interest is due each quarter?

4. If the cost of the interest on a loan of $180 for 2 months is $1.65, what is the rate of interest?

5. A mechanic is working on a construction project where his regular time is 8 hours a day for 5 days a week, Monday through Friday. He receives time and a half for overtime on these days and double time for all work on Saturdays and Sundays. His regular wage is $2.10 an hour. Last week he worked 9 hours a day for the seven days. What were his total earnings for the week?

Group B

1. (a) What amount decreased by $7\frac{1}{2}\%$ of itself gives $52.91? (b) Find the interest on $809.75 for 19 days at 6%. (c) Express $115\frac{3}{8}\%$ in decimal form. (d) Find the number of days from April 3 to June 18. (e) $9.36 is $\frac{4}{3}$ of what amount?

2. A demand note for $1,100, dated June 18, bearing interest at 6%, was settled in full on August 25. What was the amount due on the date of settlement?

3. On March 1, R. E. Blake placed an $8,500 mortgage at 6% on his home. The mortgage agreement required the quarterly payment of interest, together with a payment of $100 on the principal. (a) What amount was Blake required to pay at the end of the first quarter? (b) At the end of the second quarter? (c) At the end of the third quarter?

4. If the amount of interest on a loan of $150 for 4 months is $2.50, what is the rate of interest?

5. A salesman receives a salary of $265 a month and a commission of 2½% on all sales. What must be the amount of his sales each month in order that his total monthly income may be $500?

Group C

1. (a) $585 is 4% of what amount? (b) Find the interest on $692.45 for 21 days at 6%. (c) Express 5.12½ as a mixed number. (d) Find the number of days from May 10 to September 15. (e) Multiply 2.65 by 22,000. (f) Express 92⅝% as a decimal.

2. G. A. Bruce held a 5% mortgage for $3,000 on the property of George Halton. The mortgage was dated August 15, 1952. The interest and $125 on the principal were paid every six months thereafter. (a) How much was paid on the principal up to the first of February, 1955? (b) What was the total amount due on February 15, 1955, the date of final settlement? (c) What was the total amount of interest paid for the use of the money?

3. On January 1, Elmer Ross placed a $3,200 mortgage at 4% on his home. The mortgage agreement required the quarterly payment of interest, together with a payment of $100 on the principal. (a) What amount was Ross required to pay at the end of the first quarter? (b) At the end of the second quarter? (c) At the end of the third quarter?

4. A 6% demand note for $825, dated June 1, was paid in full on August 9. What was the amount of the payment?

5. A real estate agent sold a piece of property for Collier for $35,650. How much did Collier receive if the agent deducted 4½% commission and expenses amounting to $243.75?

Section 5 . . . Borrowing from a Credit Union or a Loan Company

Personal Loan Agencies. Under the laws of the various states, numerous lending agencies have been organized to meet the needs of those wage earners and others who have no security or other means of borrowing from a regular bank. These lending agencies include such organizations as credit unions, small-loan companies, and industrial banks, better known as *Morris Plan* banks.

Loans obtained from personal loan agencies are repaid by installments at regular intervals, such as weekly, semi-monthly, or monthly.

Because of the added cost of investigating the character and financial responsibility of the borrower, and the extra expense for bookkeeping, collection, and legal services, personal loan agencies are permitted by state laws to charge higher annual rates of interest than the ordinary legal rates.

Borrowing from a Credit Union. A *credit union* is an organization composed of persons having a common interest, such as a common occupation. Thus, the employees in a certain factory or the teachers, firemen, or policemen in a certain city may form a credit union. Each member is required to purchase one or more shares in the credit union, ordinarily at the price of $5 a share. The money that the credit union obtains in this manner is loaned to those of its members who wish to borrow. Only the members may borrow from the credit union.

When money is borrowed from a credit union the borrower receives the face amount of the loan. This amount is repaid in equal weekly, semimonthly, or monthly installments. At the end of each period, the borrower pays the amount of the installment plus one period's interest on the unpaid balance that has been in force during the period. The interest rate varies in different states. The usual rate is about 1% a month, which is equivalent to 12% a year.

The rates charged by credit unions often can be lower than those charged by other small-loan agencies because there is less difficulty, and hence less expense, in making the investigation of the borrower. Also, the operating costs are lower because the members and officers operate the credit union with little or no compensation for their services.

Example: Mr. Charles Gray borrowed $200 from a credit union of which he is a member, agreeing to repay the loan in four monthly payments of $50 each plus interest at 1% a month on the unpaid balance. Prepare a schedule showing the unpaid balances, the monthly payments of principal and interest, and the total of each monthly payment.

Solution

1. *Month*	*2.* *Unpaid balance*	*3.* *Interest: 1% of unpaid balance*	*4.* *Payment on principal*	*5.* *Total payment*
1st month	*$200.00*	*$2.00*	*$ 50.00*	*$ 52.00*
2d month	*150.00*	*1.50*	*50.00*	*51.50*
3d month	*100.00*	*1.00*	*50.00*	*51.00*
4th month	*50.00*	*.50*	*50.00*	*50.50*
		$5.00	*$200.00*	*$205.00*

Explanation

The unpaid balance in force during the first month was $200. That is, during the first month, Mr. Gray had the use of $200 for one month. At the end of that month, he paid the interest on $200 for one month, which was 1% of $200, or $2. He also repaid $50 of the principal. His total payment at the end of the first month was therefore $2 + $50, or $52.

Since Mr. Gray repaid $50 of the principal at the end of the first month, he had the use of only $150 during the second month. At the end of the second month, he paid the interest on $150 for one month, which was 1% of $150, or $1.50. Also, he repaid $50 of the principal. The total payment made at the end of the second month was therefore $1.50 + $50, or $51.50.

Similarly, Mr. Gray's total payment at the end of the third month was found to be $51 and that at the end of the fourth month, $50.50.

The sum of the totals of columns 3 and 4 of the schedule should equal the total of column 5.

Exercise 18. (Written)

1. Louise Parsons borrowed $160 from a credit union of which she is a member, agreeing to repay the loan in four monthly payments of $40 each plus interest at 1% a month on the unpaid balance. Prepare for Miss Parsons a schedule similar to the one on page 162, and show the total of the interest, the total of the payments on the principal, and the total of the payments to the credit union.

2. Thomas McCoy borrowed $180 from the Westchester Manufacturing Company Employees Credit Union, of which he is a member, and repaid it in five monthly payments of $36 plus interest at $\frac{3}{4}\%$ per month on the unpaid balance. (a) What was the total amount he paid to the credit union? (b) What was the total cost of the interest on the loan?

3. A member borrows $240 from his credit union, agreeing to repay it in four equal monthly payments plus interest at $1\frac{1}{4}\%$ per month on the unpaid balance. What will be the total interest cost for the four months?

4. Oliver Whitney borrows from a credit union $200, to be repaid at the rate of $40 a month plus interest at 1% a month on the unpaid balance. (a) What will be the total cost of the interest on the loan? (b) What is the total amount he will be required to pay to the credit union?

5. William Sackrider borrowed $300 from the Williams Printing Company Employees Credit Union, of which he is a member, and repaid it at the rate of $60 a month, with interest at $\frac{3}{4}\%$ a month on the unpaid balance. (a) What was the total amount he was required to pay to the credit union? (b) What was the total cost of the interest on the loan?

Borrowing from a Small-Loan Company. Small-loan companies, sometimes referred to as personal finance companies, operate under the small-loan laws of the states in which they carry on their business.

The maximum amount that may be borrowed from a small-loan company is usually $300. The borrower receives the face amount of the loan. Repayment is made in monthly installments with interest on the unpaid balances. The interest rate varies in different states. In most states the maximum allowable rate does not exceed 3% a month, although in a few states a monthly rate of $3\frac{1}{2}\%$ is allowed.

In some instances two maximum rates are allowed, as for example, 3% a month on that part of the loan which does not exceed $100 and 2% a month on any part in excess of $100.

Example: You wish to borrow $300 from the Premier Finance Company and pay it back in installments of $75 each month on the principal. The company will charge 3% a month on that part of the loan which does not exceed $100 and 2% a month on that part of the loan which exceeds $100. Find the total interest cost that you would be charged by the company.

Solution

				Interest		
1. Month	*2. Unpaid balance*	*3. Amount not exceeding $100*	*4. Amount exceeding $100*	*5. 3% of amount in column 3*	*6. 2% of amount in column 4*	*7. Total interest*
1st month	*$300*	*$100*	*$200*	*$3.00*	*$4.00*	*$7.00*
2d month	*225*	*100*	*125*	*3.00*	*2.50*	*5.50*
3d month	*150*	*100*	*50*	*3.00*	*1.00*	*4.00*
4th month	*75*	*75*	*none*	*2.25*	*none*	*2.25*
						$18.75

Explanation

The unpaid balance during the first month is $300. Interest on the first $100 of this amount is charged at the rate of 3% a month. Interest on the remainder, $200, is charged at the rate of 2%. The total interest charge for the first month is therefore $3.00 + $4.00, or $7.00, as shown in column 7.

Since $75 of the principal is paid at the end of the first month, the unpaid balance during the second month is $225. Interest on the first $100 of this amount is charged at the rate of 3% a month and on the remainder, $125, at the rate of 2%. The total interest charge for the second month is therefore $3.00 + $2.50, or $5.50.

In a similar manner the total interest for the third month is found to be $4.00 and that of the fourth month, $2.25.

The sum of the amounts in column 7 gives the total interest charge on the entire loan, $18.75.

Exercise 19. (*Written*)

1. You wish to borrow $200 and pay it back in installments of $50 each month on the principal. A loan company will charge 3% a month on that part of the loan which does not exceed $100 and 2% a month on that part of the loan which exceeds $100. Prepare a schedule like the one shown on page 162, and find the total interest cost that would be charged by the loan company.

2. You wish to borrow $300 and pay it back in installments of $75 each month on the principal. A loan company will charge 3% a month on that part of the loan which does not exceed $150 and 2½% a month on that part of the loan which exceeds $150. What will be the total cost of the interest if you obtain the loan from the loan company?

3. Your father needs $125. A loan company will lend him the money, which he may repay in $25 monthly installments plus interest on the unpaid balances. Interest rates are 2½% a month on that part of the loan which does not exceed $100 and 2% on that part of the loan which exceeds $100. If he borrows from the loan company, how much interest would he have to pay the company?

To Find the Total Cost of the Interest When the Total of Each Installment Payment Is the Same Amount. Many personal finance companies have worked out the repayment of the principal and interest in such a manner that the total of each monthly payment is the same amount. For example, in the case of one prominent company, if the borrower wishes to repay a $100 loan in 6 monthly payments, the amount he must pay each month is $18.15. When this is the case, the total cost of the interest is the difference between the amount the borrower receives and the total amount he pays to the company. If he receives $100 and repays by making 6 payments of $18.15 each, totaling $108.90, the total interest paid by the borrower is $108.90 − $100, or $8.90.

Exercise 20. (*Written*)

1. A personal finance company offers to lend Burt Rice $125, to be repaid in six monthly payments of $22.67 each, including interest. If he accepts the offer, how much will he pay the company for interest on the loan?

2. Herbert Marx can borrow $200 from a loan company and repay it in nine monthly installments of $24.92 each. How much will the interest cost him?

3. If a loan of $300 is repaid in fifteen monthly installments of $23.80 each, how much is the interest cost?

INTEREST (*Continued*)

Combinations Involving Parts of Aliquot Parts of 60 Days. Frequently the interest for a given number of days can be built up conveniently by finding the interest for an aliquot part of 60 days and adding to that amount an aliquot part of itself. The following combinations are suggestive:

11 da. = 10 + 1 ($\frac{1}{10}$ of 10)
22 da. = 20 + 2 ($\frac{1}{10}$ of 20)
23 da. = 20 + 2 ($\frac{1}{10}$ of 20) + 1 ($\frac{1}{2}$ of 2)
25 da. = 20 + 5 ($\frac{1}{4}$ of 20)
35 da. = 30 + 5 ($\frac{1}{6}$ of 30)
41 da. = 30 + 10 ($\frac{1}{3}$ of 30) + 1 ($\frac{1}{10}$ of 10)

Example: Find the interest at 6% on $897.50 for 11 da.

Solution

6)$8	*9750*	*= int. for 60 da.*
$1	*4958*	*= int. for 10 da.*
	1496	*= int. for 1 da.*
$1	*6454*	*= int. for 11 da.*

Ans. $1.65

Explanation

11 da. = 10 da. + 1 da. Since 10 da. is $\frac{1}{6}$ of 60 da., the interest for 10 da. is the interest for 60 da. divided by 6. Since 1 da. is $\frac{1}{10}$ of 10 da., the interest for 1 day is found by moving the decimal point 1 place to the left in the interest for 10 da., or by shifting the figures one place to the right.

Exercise 21. (*Written*)

Find the interest at 6% on:

	1.	**2.**	**3.**
a.	$378.39 for 11 da.	$608.30 for 51 da.	$429.60 for 44 da.
b.	$906.75 for 31 da.	$928.30 for 22 da.	$360.75 for 50 da.
c.	$516.74 for 41 da.	$445.50 for 23 da.	$557.68 for 17 da.
d.	$811.75 for 43 da.	$783.79 for 28 da.	$943.75 for 25 da.
e.	$327.38 for 47 da.	$674.70 for 33 da.	$321.60 for 35 da.
f.	$410.15 for 49 da.	$126.75 for 34 da.	$416.50 for 71 da.
g.	$873.93 for 45 da.	$375.60 for 39 da.	$736.88 for 82 da.

Problems for Application and Review

Group A

1. (a) Express $2\frac{3}{5}\%$ as a decimal. (b) Find the interest at 6% on $1,341.75 for 11 days. (c) Find the number of days from August 24 to November 6. (d) Express $102\frac{5}{8}\%$ in decimal form. (e) $65.34 is 35% more than what amount?

2. A member borrows $200 from his credit union, agreeing to repay it in five equal monthly payments plus interest at 1% per month on the unpaid balance. What will be the total interest cost for the five months?

3. What is the rate of interest charged on a loan of $500 for 6 months if the amount of the interest charge is $11.25?

4. Last year a firm's sales were as follows: hats, $5,490; shoes, $8,000. The preceding year the sales were: hats, $6,000; shoes, $7,500. Find the per cent increase or decrease in sales for each article.

5. A sales clerk is paid $36.50 a week plus a commission on all sales in excess of $500 in any single week. Last week her total sales amounted to $740. If her total earnings for the week were $44.90, what rate of commission was she paid?

Tues
~~Wed~~

Group B

1. (a) $35.75 is 30% more than what amount? (b) Find the interest on $704.81 for 22 days at 6%. (c) Find the number of days from June 4 to October 7. (d) $37.29 is 45% less than what amount? (e) What per cent of $52 is $19.50?

2. You wish to borrow $200 and pay it back in installments of $50 each month on the principal. A certain loan company will charge 2% a month on that part of the loan which does not exceed $100 and 1% a month on that part of the loan which exceeds $100. What will be the total cost of the interest?

3. A 5% mortgage for $5,200, dated June 1, 1954, requires the quarterly payment of interest together with a payment of $100 on the principal. What amount is due for payment on June 1, 1955?

4. A store's average monthly sales for the first 10 months of last year were $3,621.63. Sales for the 11th and 12th months were $4,216.30 and $5,899.16, respectively. Find the average monthly sales for the 12 months.

Wed
~~Thur~~

Section 6 . . . Borrowing from Other Loan Agencies

Borrowing from the Personal Loan Department of a Commercial Bank. In recent years many banks have established personal loan departments and have entered into competition with the older personal loan organizations. The methods and terms of the personal loan departments vary with different banks.

At some banks the borrower receives the face amount of the loan. Interest is computed on the face amount at an annual rate for the time the loan is to run. The combined total of the face amount and the interest is repaid in equal monthly installments.

At others, the loan is made on a discount basis; that is, the interest is deducted from the face amount, and the borrower receives the proceeds. The face amount is then repaid in regular installments.

Example: You wish to borrow $300 and pay it back in six monthly installments. The personal loan department of a local commercial bank offers to make the loan under the agreement that you pay 6% interest on the face of the loan for six months and that you repay the combined total of the principal and interest in six equal monthly installments. (a) If you accept the bank's offer, what is the total amount you will pay the bank? (b) What will be the amount of each monthly payment?

Solution

(*a*) *Face of loan*	*$300.00*
Interest at 6% on $300 for 6 mo.	*9.00*
Total amount to pay	*$309.00 Ans.*

(*b*) *$309.00 ÷ 6 = $51.50 Ans.*

If the loan in the example were made on the discount basis, you would receive $300 − $9, or $291; and the monthly payments would be $300 ÷ 6, or $50.

Borrowing from an Industrial Bank. Loans by industrial banks are usually made on the discount basis. Interest is charged on the face amount at an annual rate for the time the loan is to run. Usually there is a service charge in addition to the interest. The sum of the interest and service charge is deducted from the face amount, and the borrower receives the proceeds. Repayment of the face amount is made in weekly or monthly installments.

Exercise 22. (*Written*)

1. You borrow $300 from the personal loan department of your local commercial bank, agreeing to pay 6% interest on the face of the loan and to repay the combined total of the principal and interest in eight equal monthly payments. (a) What will be the cost of the interest on the loan? (b) What will be the amount of each monthly payment?

2. Lewis Carter obtained a loan at the personal loan department of the City National Bank by signing a note for $450 and agreeing to repay that amount in fifteen equal monthly installments. The bank deducted, in advance, fifteen months' interest on the face amount at the rate of 6% per annum. (a) What proceeds did he receive? (b) What was the amount of each monthly payment?

3. William Stevenson obtained a loan at an industrial bank by signing a note for $276 and agreeing to repay that amount in twelve equal monthly installments. The bank deducted, in advance, twelve months' interest on the face amount at the rate of 6% per annum and a service charge amounting to $7.92. (a) What proceeds did Mr. Stevenson receive? (b) What was the amount of each monthly payment?

4. Chester Millard can borrow $175 from the personal loan department of a local bank and repay it in twelve monthly installments of $15.30 each. How much does the interest cost amount to?

5. If Walter Cross borrows $250 from the personal loan department of his bank and repays it in nine monthly installments of $28.82 each, what is the cost of the interest on the loan?

To Find the Yearly Rate of Interest Charged on Loans Repaid by Installments. When interest at a given rate per month is charged on the unpaid balance at the time of each monthly payment, the actual yearly rate of interest is 12 times the monthly rate. Thus if money is borrowed from a credit union that charges 1½% on the unpaid balance at the time of each monthly payment the actual yearly rate is 12 times 1½%, or 18%.

When interest is charged on some other basis than the unpaid balance at the time of each monthly payment, there are several ways of figuring the actual yearly rate of interest. The exact method requires the use of a special interest formula. The following example illustrates one method of approximation that is easy to apply and which gives a result that is near enough to the exact rate for most purposes.

Example: George Bennett borrowed $200 from a loan company. He repaid the loan by making four monthly payments of $52.94 each. What yearly rate of interest did he pay?

Solution and Explanation

The total cost of the interest is the difference between the amount he received from the loan company, $200, and the amount he repaid to the company, $211.76 (4 × $52.94). The cost of the interest is therefore $211.76 − $200.00, or $11.76.

Since Mr. Bennett made four monthly payments to the loan company, it is assumed that the $200 he originally received from the company was repaid at the rate of $50 a month ($200 ÷ 4). Under this assumption he had the use of $200 the first month, $150 the second, $100 the third, and $50 the fourth. The average amount that he had the use of for four months was $125, calculated as follows:

$$\frac{\$200 + \$150 + \$100 + \$50}{4} = \frac{\$500}{4} = \$125$$

For four months' use of the average amount, $125, Mr. Bennett paid $11.76. At the same rate, the interest for a year would cost 3 x $11.76, or $35.28. The yearly rate of interest is therefore $35.28 ÷ $125, or 28.2%.

Short Method of Finding the Average of a Loan Repaid in Equal Installments. In solving the example given above, it was necessary to find the average of $200, $150, $100, and $50. The average of such a series can be found quickly by dividing the sum of the first and last items ($200 and $50) by 2. The result is $250 ÷ 2, or $125. This short method of finding the average is particularly advantageous when it is desired to find the average of a relatively long series.

Exercise 23. (Written)

1. (a) Frank Ulmer borrowed $120, which he repaid in four equal monthly payments. What average amount did he have the use of for the four months?

(b) The total interest that he paid during the four months was $5. At the same rate, what would be the cost of the interest for one year?

(c) The interest for one year is what per cent of the average principal?

2. (a) Donald Terry borrowed $150, which he repaid in three equal monthly payments. What average amount did he have the use of during the three months?

(b) The total interest that he paid during the three months was $6. At the same rate, what would be the cost of the interest for one year?

(c) What yearly rate of interest did he pay on the average principal?

3. Fred Rapp borrowed $200, which he repaid in five equal monthly payments. The total interest that he paid during the five months was $12.50. (a) What average amount did he have the use of for five months? (b) What yearly rate of interest did he pay on the average amount?

4. Grace Odell borrowed $80, which she repaid in four monthly installments of $20.75 each, including interest. (a) What average principal did she have the use of? (b) How much interest did she pay? (c) What yearly rate of interest did she pay?

5. David Lynch borrowed $240 from the Premiere Loan Company. He is to repay the loan in six monthly payments of $43.50 each. What yearly rate of interest will he pay?

INTEREST (Continued)

To Find Interest at 6% for Any Number of Months. Since interest is proportional to the time, the interest for any number of months may be found by first obtaining the interest for 2 months and then multiplying that result by the appropriate factor.

For example, 1 month is $\frac{1}{2}$ of 2 months. The interest for 1 month is therefore $\frac{1}{2}$ times the interest for 2 months. Similarly, since 3 months is $1\frac{1}{2}$ times 2 months, the interest for 3 months is $1\frac{1}{2}$ times the interest for 2 months; likewise, the interest for 4 months is 2 times the interest for 2 months; and so on.

Thus, since the interest on $300 at 6% for 2 months is $3,

Int. on $300 at 6% for 1 mo. = $\frac{1}{2} \times \$3.00 = \$1.50$
Int. on $300 at 6% for 3 mo. = $1\frac{1}{2} \times \$3.00 = \$4.50$, etc.

Exercise 24. (Oral)

State the interest at 6% on:

1. $225 for 2 mo.
2. $340 for 1 mo.
3. $100 for 3 mo.
4. $150 for 4 mo.
5. $200 for 5 mo.
6. $120 for 8 mo.
7. $80 for 7 mo.
8. $70 for 5 mo.
9. $130 for 1 mo.

Interchanging the Principal and the Time Expressed in Days. In any problem where interest is to be computed, the principal and the time in days may be interchanged without affecting the result. For example, the interest at 6% on $30 for 600 days and the interest at 6% on $600 for 30 days are the same amount, $3.

This principle can often be applied to simplify the calculation of the interest when the principal is $6, $60, $600, or $6,000, or multiples or aliquot parts of these amounts.

Thus, if you wish to find the interest at 6% on $180 for 43 days, you can obtain the answer more readily by finding the interest on $43 for 180 days. Since 180 days is 3 times 60 days, the answer is seen at once to be $1.29.

$.43 = int. on $43 for 60 da.
3 × $.43 = $1.29, int. for 180 da. *Ans.* $1.29

Similarly, if your problem is to find the interest at 6% on $450 for 52 days, you can obtain the answer quickly by finding the interest on $52 for 450 days. Since 450 days is $\frac{3}{4}$ of 600 days, the answer will be $3.90.

$5.20 = int. on $52 for 600 da.
$\frac{3}{4}$ × $5.20 = $3.90, int. for 450 da. *Ans.* $3.90

Exercise 25. (Oral)

State the interest at 6% on:

1. $600 for 19 da.
2. $60 for 34 da.
3. $6,000 for 13 da.
4. $600 for 77 da.
5. $6,000 for 21 da.
6. $240 for 61 da.
7. $1,800 for 22 da.
8. $12,000 for 19 da.
9. $30 for 68 da.
10. $400 for 27 da.
11. $1,000 for 84 da.
12. $70 for 126 da.
13. $750 for 28 da.
14. $8,000 for 33 da.
15. $900 for 46 da.

Problems for Application and Review

Group A

1. (a) $240 is what per cent less than $288? (b) Find the interest at 6% on $387.35 for 67 days. (c) $17.94 is 15% more than what amount? (d) $36.50 is $\frac{2}{5}$ of what amount? (e) Divide 442 by $8\frac{1}{2}$. (f) Express $73\frac{7}{8}\%$ as a decimal.

2. You can borrow $350 from your local bank by agreeing to pay interest at the rate of 5% per annum on the face of the loan and to repay the combined total of the principal and interest in six equal monthly payments. What will be the amount of each monthly payment?

3. John Moran borrows from a credit union $160, to be repaid at the rate of $40 a month plus interest at $\frac{3}{4}$% a month on the unpaid balance. What will be the total interest cost?

4. A 6% note for $275, dated April 22, was paid in full on June 29. What was the amount of the June 29 payment?

5. H. B. Wilson accepted a position as salesman at a monthly salary of $400 with a 6% commission on all sales over $8,000 a month. Wilson's sales in March amounted to $7,950, in April $10,250, and in May $10,675. (a) What was the total commission that Wilson was entitled to receive? (b) What was Wilson's average monthly commission for the three months? (c) What was Wilson's total income for the three months?

Group B

1. (a) $5.40 is $4\frac{1}{2}$% of what amount? (b) $3.15 is what per cent less than $3.60? (c) Express $112\frac{7}{8}$% in decimal form. (d) Find the number of days from September 10 to December 5. (e) Find the interest on $2,150 at 6% for 76 days.

2. You can borrow $150 from your local bank by agreeing to pay interest at the rate of 6% per annum on the face of the loan and to repay the combined total of the principal and interest in six equal monthly payments. What will be the amount of each monthly payment?

3. If $6.25 interest is charged on a loan of $250 for 10 months what is the rate of interest?

4. If a real estate agent who charges $4\frac{1}{2}$% commission received $3,438 for selling a piece of property, at what price was the property sold?

5. F. G. Hart sold a house and lot through a real estate agent who charged 5% commission. His net proceeds, after paying the agent's commission, amounted to $9,737.50. What was the sale price of the house and lot?

Section 7 . . . Installment Buying

Buying on the Installment Plan. Automobiles, television sets, radios, washing machines, furniture, clothing, and many other articles are often purchased on the *installment plan,* sometimes referred to as the *deferred-payment* or *time-payment plan.*

A Record Player for Sale on Installment Terms

At the time of purchase the installment purchaser is usually required to make a "down payment" of part of the purchase price. He is also required to sign a contract in which he agrees to pay the remainder in a series of payments at stated intervals, usually weekly, semimonthly, or monthly.

Carrying Charge. The installment price of an article is usually higher than the regular cash price. The amount by which it exceeds the cash price is known as the *carrying charge.* The purpose of the carrying charge is to reimburse the merchant for interest on his money and to cover the additional expenses that result from doing business on an installment basis.

Example: A floor lamp in a furniture store bears a cash price of $25. The installment terms are $5 down and $2.25 a month for 10 months. What is the installment price of the lamp? How much is the carrying charge?

Solution

Down payment	*$ 5.00*
Installments—10 × $2.25	*22.50*
Installment price	*$27.50*
Cash price	*25.00*
Carrying charge	*$ 2.50*

Explanation

The installment price is the sum of the down payment and the installment payments. The carrying charge is the difference between the installment price and the cash price.

Exercise 26. (*Written*)

1. A gas range is priced for cash sale at $165.95. On the installment plan it costs $189.75. What is the carrying charge?

2. The cash price of a rug is $59.25. The installment terms are $7.75 down and 6 monthly payments of $9.50 each. (a) What is the installment price of the rug? (b) How much is the carrying charge?

3. An electric washing machine may be purchased for a down payment of $15 and 15 monthly payments of $9.75 each. If the cash price is $145, what is the extra cost of the installment price over the cash price?

4. A wrist watch that retails for $40 cash, may be purchased for $5.50 down and $2.75 per month for 14 months. (a) What is the carrying charge? (b) Express the carrying charge as a per cent of the cash price.

5. A bicycle is priced for cash sale at $42.50. On the installment plan the terms are $4.10 down and $1.45 a week for 30 weeks. (a) How much more would an installment buyer pay for this bicycle than a cash buyer? (b) What per cent more?

Finance Companies. Much of the financing of installment sales is done through finance companies. A finance company is a special type of banking institution that purchases from merchants the contracts of customers who buy on the installment plan.

Finance companies of the kind referred to here should not be confused with the small-loan companies, or personal finance companies, referred to in Section 5 on page 161.

For example, a person may purchase an automobile priced at $2,400, cash price, and give the automobile dealer a down payment of $800. The amount to be financed is the unpaid balance, $1,600. The buyer signs an installment contract in favor of the dealer for the payment of the unpaid balance plus a carrying charge. The amount of the carrying charge is often fixed by the finance company that is going to purchase the contract. The dealer sells the contract at once to the finance company, receiving from the company the unpaid balance, $1,600. In this way the dealer obtains cash in full payment of the car immediately—$800 from the buyer and $1,600 from the finance company. The buyer makes his installment payments to the finance company.

Exercise 27. (*Written*)

In each of the following problems find the amount of the monthly payment to the *nearest cent.*

1. Lester Howard bought an automobile for $2,430. He paid $810 cash. The balance was handled through a finance company to which he was to make equal monthly payments for 18 months. The company's carrying charges for the transaction amounted to $145.80. What amount did Mr. Howard pay the finance company each month?

2. Mrs. R. M. Davis bought a set of furniture that retailed at $385. She made a down payment of $40. The payment of the balance was handled through a finance company whose carrying charges amounted to $25.80. The total due was to be divided into 15 equal monthly payments. What amount did Mrs. Davis pay the finance company each month?

3. Mr. C. E. Boyd bought from the Slocum Motor Sales Agency a new automobile priced at $2,340, making a down payment of $780. The balance was handled through a finance company to which he was to make 16 equal monthly payments. The company's carrying charge for financing the transaction was $124.80. What amount did Mr. Boyd pay the finance company each month?

To Find the Yearly Rate of Interest on an Installment Purchase. When a person buys an article on the installment plan, he is really borrowing money from the merchant. The amount borrowed is represented by the cash price minus the down payment.

The carrying charge represents interest that the buyer pays for the use of the merchant's money. The rate of interest he is paying is found in the same way as that explained on page 168 for finding the actual rate of interest on a loan repaid in installments.

Example: A radio was purchased on the installment plan for \$37, terms \$3 down and 4 monthly payments of \$8.50 each. The cash price was \$35. What yearly rate of interest did the buyer pay for the use of the merchant's money?

Solution and Explanation

(1) \$37 − \$35 = \$2, the carrying charge, or interest that the buyer paid for the use of the merchant's money.

(2) \$35 (cash price) − \$3 (down payment) = \$32, amount of the merchant's money the buyer was using. Since he made 4 monthly payments, he repaid $\frac{1}{4}$ of \$32, or \$8, each month. Hence, the buyer had the use of \$32 of the merchant's money the first month, \$24 the second, \$16 the third, and \$8 the fourth. The average amount for the 4 months was (\$32 + \$8) ÷ 2, or \$20.

(3) The buyer paid \$2 for the use of \$20 for 4 months, or $\frac{1}{3}$ of a year. This is at the rate of \$2 ÷ $\frac{1}{3}$, or \$6, for 1 year. The yearly rate of interest is therefore \$6 ÷ \$20, or 30%. *Ans.*

Exercise 28. (*Written*)

Compute the rate of interest to the nearest *tenth per cent.*

1. The cash price of a desk lamp is \$25. On the installment plan, the price is \$27.50, terms \$5 down and \$2.25 a month for 10 months. What actual rate of interest may an installment purchaser consider he is paying?

2. The installment price of a gas range is \$194.25, terms \$23.25 down and 6 monthly payments of \$28.50 each. The cash price is \$177.75. What rate of interest is paid by the installment buyer?

3. An encyclopedia is offered for \$125 cash or for \$5 down and \$9.50 a month for 15 months. What rate of interest is paid by the installment purchaser?

4. The cash price of a set of furniture is \$290. If it is bought on the installment plan, a down payment of \$30 is required. To the unpaid balance a carrying charge of \$30.80 is added, and the combined total must be paid in 18 equal monthly payments. What rate of interest is paid if it is bought on the installment plan?

5. When an automobile tire is sold on the installment plan, the Colonial Auto Accessories Store adds a carrying charge of 10% to its $18 cash price. A down payment of 20% of the installment price is required at the time of purchase, the balance to be paid in four equal monthly installments. What actual rate of interest is paid by the installment purchaser?

INTEREST (*Concluded*)

To Calculate Interest at Rates Other than 6%. There are three methods for calculating interest at rates other than 6%.

Method 1. *Calculate the interest by taking an appropriate aliquot part of the interest at 6%. This method is used for such rates as 1% ($\frac{1}{6}$ of 6%), $1\frac{1}{2}$% ($\frac{1}{4}$ of 6%), 2% ($\frac{1}{3}$ of 6%), and so on.*

Example: Find the interest at $1\frac{1}{2}$% on $960 for 26 da.

Solution

3)$9	*60 = int. for 60 da. @ 6%*
3	*20 = int. for 20 da. @ 6%*
	96 = int. for 6 da. @ 6%
4)$4	*16 = int. for 26 da. @ 6%*
$1	*04 = int. for 26 da. @ $1\frac{1}{2}$%*

Explanation

Since $1\frac{1}{2}$% is $\frac{1}{4}$ of 6%, the interest at $1\frac{1}{2}$% is found by dividing the interest at 6% by 4.

Ans. $1.04

Method 2. *Find the interest at 6%, then add or subtract the appropriate aliquot part of the interest at 6%. This method is used for such rates as 7% (6% + $\frac{1}{6}$ of 6%), 5% (6% − $\frac{1}{6}$ of 6%), $7\frac{1}{2}$% (6% + $\frac{1}{4}$ of 6%), and so on.*

Method 3. *Divide the interest at 6% by 6, and multiply that result by the given rate. This method is used when an aliquot part of 6% cannot be used conveniently.*

Example: Find the interest at $2\frac{1}{4}$% on $1,120 for 15 da.

Solution

4)$11	*20 = int. for 60 da. @ 6%*
6)$ 2	*80 = int. for 15 da. @ 6%*
$	*4667 = int. for 15 da. @ 1%*
	× $2\frac{1}{4}$
	1167
	9334
$ 1	*0501 = int. for 15 da. @ $2\frac{1}{4}$%*

Explanation

The interest at 1% is found by dividing the interest at 6% by 6.

$2\frac{1}{4}$% is $2\frac{1}{4}$ times 1%. The interest at $2\frac{1}{4}$% is found by multiplying the interest at 1% by $2\frac{1}{4}$. *Ans. $1.05*

Exercise 29. (*Written*)

Find the interest on:

	1.	2.
a.	\$336 for 40 da. @ 3%	\$285 for 17 da. @ $7\frac{1}{2}$%
b.	\$702 for 44 da. @ 2%	\$850 for 49 da. @ $4\frac{1}{2}$%
c.	\$648 for 71 da. @ $1\frac{1}{2}$%	\$336 for 23 da. @ 8%
d.	\$725 for 47 da. @ 1%	\$752 for 19 da. @ 5%
e.	\$350 for 22 da. @ 7%	\$925 for 32 da. @ 4%
f.	\$490 for 31 da. @ 5%	\$990 for 20 da. @ $2\frac{1}{2}$%

3.

a. \$576 for 30 da. @ $3\frac{1}{2}$%
b. \$564 for 21 da. @ $5\frac{1}{4}$%
c. \$300 for 21 da. @ $5\frac{1}{4}$%
d. \$400 for 33 da. @ $4\frac{1}{4}$%
e. \$460 for 25 da. @ $5\frac{3}{4}$%
f. \$640 for 45 da. @ $3\frac{3}{4}$%

To Calculate Interest Mentally When the Rate Is a Fractional Part of 6%. When the rate is a fractional part of 6%, multiply the interest at 6% by the fractional equivalent of the given rate. For example, since 4% is $\frac{2}{3}$ of 6%, the interest on \$360 for 30 days at 4% is $\frac{2}{3}$ of \$1.80 (the interest at 6% on \$360 for 30 days), or \$1.20.

The more commonly used fractional equivalents are:

1% = $\frac{1}{6}$ of 6%
$1\frac{1}{2}$% = $\frac{1}{4}$ of 6%
2% = $\frac{1}{3}$ of 6%
3% = $\frac{1}{2}$ of 6%
4% = $\frac{2}{3}$ of 6%
$4\frac{1}{2}$% = $\frac{3}{4}$ of 6%
5% = $\frac{5}{6}$ of 6%

Exercise 30. (*Oral*)

State the interest on:

1. \$660 for 60 da. @ 5%
2. \$180 for 20 da. @ $4\frac{1}{2}$%
3. \$240 for 15 da. @ 4%
4. \$200 for 3 mo. @ 3%
5. \$360 for 2 mo. @ 2%
6. \$160 for 30 da. @ $1\frac{1}{2}$%

Problems for Application and Review

1. (a) \$68.40 is 5% less than what amount? (b) Find the interest at 6% on \$619.32 for 71 days. (c) \$88.20 is 5% more than what amount? (d) Express $1\frac{1}{4}$% as a decimal. (e) 84 is what per cent less than 112? (f) Find $4\frac{1}{6}$% of \$450.

2. Earl Kendall bought a used car priced at $450, making a down payment of $150. He agreed to pay the balance plus a $14 carrying charge in 20 equal weekly payments. What is the amount of each weekly payment?

3. The cash price of a radio was $120. Mrs. Barton purchased it for a down payment of $12 and 12 monthly installments of $9.80. By what per cent does this installment price exceed the cash price?

4. You wish to borrow $200 and pay it back in installments of $50 each month on the principal. The total interest and other charges made by a bank for this loan will be $4.75. A loan company will charge 3% a month on that part of the loan which does not exceed $100 and 2% a month on that part of the loan which exceeds $100. (a) Find the total interest cost that would be charged by the loan company. (b) From which concern would it be better to borrow? (c) How much better?

5. A 4% mortgage for $3,500, dated November 1, requires the semiannual payment of interest together with a payment of $150 on the principal. What amount will be due for payment at the end of the second year, counted from the date of the mortgage?

Cumulative Review

1. On June 1 Grayson's bank statement showed a balance of $832.80. On that date his checkbook balance was $570.32. On comparing the canceled checks and the bank statement with the checkbook balance, he found a check for $12.15 had not been recorded on the checkbook stub, a deposit of $115.60 had not been entered on the checkbook stub, a check for $33.60 had been entered on the stub as $23.60, and the following checks were outstanding: $18.75; $46.78; $31.15; $72.35. Prepare a reconciliation statement.

2. For the first five days of the week a newsboy's daily sales of papers were 117, 125, 132, 122, and 115, respectively. How many papers must he sell on the sixth day in order that his average daily sales for the six days may be 120 papers?

3. In the factory of Cole & Davis the working schedule for employees was 40 hours per week. Time and a half was allowed for overtime. During the month of December, Hoyt worked 40 hours the first week, 36 hours the second, 46 hours the third, and 39 hours the fourth. His regular hour rate was $1.65. Find Hoyt's average weekly wage for the month of December.

4. A salesman is paid a regular monthly salary of $225, plus a commission on all sales in excess of $4,500 in any single month. Last month his total sales were $7,240 and his total earnings were $293.50. What rate of commission did he receive?

5. If a salesman is paid $150 a month and a commission of 3% on all sales in excess of $7,000 in any single month, what must be the amount of his sales each month in order that his total monthly income may be $375?

6. What rate of interest is charged if the cost of the interest on a loan of $1,400 for 18 months is $157.50?

7. Find (a) the due date and (b) the amount due at maturity on an 80-day note for $315.65, dated May 1, with interest at 6%.

8. A 70-day non-interest-bearing note for $385, dated today, is discounted today at the bank at 6%. Find the proceeds.

9. A 6% demand note for $475, dated June 15, was paid in full on August 29. What was the amount of the payment?

10. Roy Huber held a 5½% mortgage for $4,500 on the house and lot of L. A. Ryder. The mortgage was dated December 1, 1953, and the interest was payable semiannually. A notation of the following payments appeared on the bond that was attached to the mortgage:

June 1, 1954; interest due and $800 on the principal
December 1, 1954; interest due

(a) If no additional payments were made, what amount was required to pay the mortgage in full on June 1, 1955, the date of final settlement? (b) What was the total amount of interest paid for the use of the money?

11. A member borrows $300 from his credit union, agreeing to repay it in six equal monthly payments plus interest at 1% a month on the unpaid balance. What will be the total interest cost for the six months?

12. You can borrow $400 from your bank by agreeing to pay interest at the yearly rate of 4½% on the face of the loan and to repay the combined total of the principal and interest in 8 equal monthly payments. What will be the amount of each monthly payment?

UNIT VI

SAVINGS AND INVESTMENTS

Section 1 . . Savings Accounts

Savings Accounts. The most common means of accumulating savings is an account in a savings bank. The purpose of a savings bank is to accept deposits of people of small means and thus provide them a safe place to keep their money. The funds received in this way are invested by the bank in government bonds, real estate mortgages, and other high-grade securities. These investments earn an income for the bank. Out of this income the bank pays interest to the depositors for the use of their money.

Interest on Savings Accounts. The most common rate of interest today is 2% or $2\frac{1}{2}$%, although a few banks pay 3%.

Interest is added to the depositors' accounts at stated intervals, usually semiannually or quarterly. The dates on which interest is added to the accounts are called *interest days.* When interest is added semiannually, the interest days are usually January 1 and July 1. When it is added quarterly, the interest days are usually January 1, April 1, July 1, and October 1.

The period of time from one interest day to the next is called an *interest period* or *interest term.*

If interest is added to depositors' accounts on January 1, April 1, July 1, and October 1, the first interest period of the year extends from January 1 to March 31, inclusive; and the interest for the period is added on April 1. The second interest period extends from April 1 to June 30, inclusive, and the interest is added on July 1; and so on.

As a rule, interest on deposits in savings accounts is computed on the whole number of dollars only. The cents in the principal are disregarded. For example, if Homer Black has $635.87 on deposit in the Home Savings Bank, the interest would be computed as though the amount on deposit were $635.

Example: The Clinton Savings Bank pays interest quarterly on deposits at the rate of 2% per annum. Interest is added to depositors' accounts on the first of January, April, July, and October. On April 1, Roger A. Dunn deposited $642.97. (a) If he made no additional deposits or withdrawals, what was his balance the following October 1? (b) What was his total interest for the six months?

Solution and Explanation

(a) The following illustration shows the entries in Dunn's bank book from April 1 to October 1.

CLINTON SAVINGS BANK

IN ACCOUNT WITH *Roger A. Dunn*

Date	Withdrawals	Interest	Deposits	Balance
April 1			*642.97*	*642.97*
July 1		*3.21*		*646.18*
Oct. 1		*3.23*		*649.41*

The deposit of April 1 drew interest for one quarter, from April 1 to June 30. The interest was computed on $642. Since the interest rate is 2% per annum, the interest rate per quarter is 2% ÷ 4, or $\frac{1}{2}$%. The interest recorded in the "Interest" column on July 1 was therefore $\frac{1}{2}$% of $642, or $3.21. This amount was added to the preceding balance, $642.97, giving $646.18, which was entered in the "Balance" column.

The July 1 balance, $646.18, drew interest for the quarter, July 1 to September 30. The interest was computed on $646 and amounted to $\frac{1}{2}$% of $646, or $3.23. This amount was recorded in the "Interest" column on October 1 and was then added to the preceding balance, $646.18. The October 1 balance was therefore $646.18 + $3.23, or $649.41.

(b) His total interest for the six months was $3.21 + $3.23, or $6.44.

To Find the Interest for One Interest Period. The amount of interest that is added to the balance of a depositor's savings account at the end of each interest period is the interest for the period of time in that interest period.

There are two methods of computing the interest for one interest period:

Method 1. Multiply the account balance by the interest rate per year to find the interest for one year. Then divide that result by the number of interest periods in one year to find the interest for one interest period.

Example: If interest is added quarterly at the rate of $1\frac{1}{2}\%$ per annum, what is the interest for one interest period on \$363.75?

Solution: $1\frac{1}{2}\%$ *of \$363 = \$5.445, int. for one year*
\$5.445 ÷ 4 = \$1.361, int. for one quarterly period
\$1.36 Ans.

Method 2. Divide the interest rate per year by the number of interest periods in a year to find the interest rate per period. Then multiply the account balance by the rate per period to find the interest for one interest period.

Example: If interest is added semiannually at the rate of $1\frac{1}{2}\%$ per annum, what is the interest for one interest period on \$363.75?

Solution: $1\frac{1}{2}\% \div 2 = \frac{3}{4}\%$*, int. rate per period*
$\frac{3}{4}\%$ *of \$363 = \$2.72*$\frac{1}{4}$*, interest for one semiannual period*
\$2.72 Ans.

In the solution of this type of problem, select the method that provides the easier calculations.

Exercise 1. (*Written*)

In each of the following problems, find the interest on the account balance for one interest period at the yearly rate indicated.

	Account Balance	Interest Yearly Rate	Interest When Paid
1.	\$967.08	1%	Semiannually
2.	\$872.43	$1\frac{1}{2}\%$	Semiannually
3.	\$738.16	2%	Semiannually
4.	\$504.19	$2\frac{1}{2}\%$	Semiannually
5.	\$435.38	3%	Semiannually
6.	\$398.56	4%	Semiannually
7.	\$696.25	$1\frac{3}{4}\%$	Semiannually
8.	\$813.46	1%	Quarterly
9.	\$910.15	$1\frac{1}{2}\%$	Quarterly
10.	\$785.88	2%	Quarterly
11.	\$827.43	$2\frac{1}{2}\%$	Quarterly
12.	\$671.90	3%	Quarterly
13.	\$455.67	4%	Quarterly

Exercise 2. (*Written*)

In each of the following problems, rule a form similar to the bank-book form shown in the illustrative example on page 181. Complete the form by recording the opening deposit or balance, the interest items, and the balances, in the order of their appearance.

1. The Glenmont Savings Bank pays interest quarterly at the rate of 2% per annum. Interest is added to depositors' accounts on the first of January, April, July, and October. On April 1, Earl Sutherland deposited $750. (a) If he made no other deposits or any withdrawals, what was his balance the following October 1? (b) What was his total interest for the six months?

2. The Conway Savings Bank pays interest at the rate of 2½% a year and adds interest to the balance on the first of January and July. After interest was recorded on January 1, Curtis Job's balance was $380. (a) If he made no additional deposits or any withdrawals, how much did he have in the bank on January 1 of the following year? (b) What was his total interest for the twelve months?

3. The interest rate of the Westwood Savings Bank is 2½% per year, payable on January 1, April 1, July 1, and October 1. On October 1, 1953, John Sloat deposited $840. (a) How much did he have on deposit on July 1, 1954, if he made no additional deposits or any withdrawals? (b) How much interest was added to his account from October 1, 1953, to July 1, 1954?

4. On April 1, Milton Prue deposited $460 in the Parkdale Savings Bank that paid interest at the rate of 2½% per annum. He made no additional deposits or any withdrawals. (a) How much interest was added to his account on October 1 of the following year if the bank paid interest on April 1 and October 1 of each year? (b) What was the balance of his account on that date?

5. The Bayfield Savings Bank pays interest at the rate of 2% per annum and adds interest to the depositors' accounts on January 1, April 1, July 1, and October 1. On July 1, Joseph Perkins deposited $1,680. (a) If he made no additional deposits or withdrawals, how much interest was added to his account on July 1 of the following year? (b) What was the balance of his account on that date?

6. The interest rate of the Belmont Savings Bank is 2% per annum, payable on April 1 and October 1. On October 1, 1952, Ben Becker deposited $1,250. (a) How much did he have on deposit on April 1, 1955, if he made no additional deposits or withdrawals? (b) How much interest was added to his account on April 1, 1955?

Interest on Savings Accounts Involving Deposits and Withdrawals. Banks vary in their methods of determining what amount shall draw interest for a given interest period in cases where the depositor makes additional deposits or withdrawals. The simplest procedure, and one that is used by many banks, is to pay interest on the smallest balance on deposit during the period. This figure is represented by the smallest amount in the balance column on the bank-book record for the period under consideration.

Example: The Waltham Savings Bank pays interest at the rate of 2% annually, the interest days being January 1, April 1, July 1, and October 1. Interest is computed on the smallest balance on deposit between interest dates. On April 1, Ray C. Carter deposited $764.50. He made additional deposits of $100 on April 20 and $125 on July 1, and withdrew $55 on September 18. What was the balance of his account on October 1?

Solution and Explanation

The solution of the problem is indicated by the entries recorded in Carter's bank book, shown below.

WALTHAM SAVINGS BANK

In Account with *Ray C. Carter*

Date	Withdrawals	Interest	Deposits	Balance
April 1			*764.50*	*764.50*
20			*100.00*	*864.50*
July 1		*3.82*		*868.32*
1			*125.00*	*993.32*
Sept. 18	*55.00*			*938.32*
Oct. 1		*4.69*		*943.01*

Since the interest rate is 2% per year, the rate per quarter is 2% ÷ 4, or ½%.

The smallest balance on deposit during the quarterly period from April 1 to June 30 was $764.50. The interest for the period was computed on $764 and amounted to ½% of $764, or $3.82.

After adding the interest and the deposit of July 1, the balance of the account at the close of business on July 1 was $993.32.

The smallest balance on deposit from July 1 to September 30 was $938.32. The interest added to the account on October 1 was therefore ½% of $938, or $4.69.

After adding the interest of October 1, the balance of the account on October 1 was $943.01.

$943.01 Ans.

Exercise 3. (*Written*)

1. Copy and complete the bank-book record shown at the right.

The Pacific Savings Bank pays 2% per annum and adds the interest on January 1 and July 1 of each year. Interest is allowed on the smallest balance on deposit during the interest period.

PACIFIC SAVINGS BANK

IN ACCOUNT WITH Merton Erickson

Date	Withdrawals	Interest	Deposits	Balance
1954				
Jan. 1		6.80		686.80
Feb. 9			210.00	?
May 22	250.00			?
July 1		?		?
July 1			175.00	?
Oct. 15	85.00			?
1955				
Jan. 1		?		?

2. Copy and complete the bank-book record shown at the right.

The Anniston Savings Bank allows interest at the rate of 2% per annum and adds interest to the depositor's account on the first day of January, April, July, and October of each year. Interest is figured on the minimum balance on deposit during the interest period.

ANNISTON SAVINGS BANK

IN ACCOUNT WITH Jerome Hanshue

Date	Withdrawals	Interest	Deposits	Balance
1954				
July 1		1.36		545.54
July 22			65.00	?
Aug. 18	100.00			?
Sept. 25			25.25	?
Oct. 1		?		?
Oct. 1	70.00			?
1955				
Jan. 1		?		?

Exercise 4. (*Written*)

In each of the following problems, rule a form similar to the bank-book form shown in the solution of the illustrative example on page 184. Complete the form by recording the deposits, withdrawals, interest items, and balances in the order of their appearance. Compute the interest according to the conditions given in the problem, assuming that interest is allowed on the smallest balance on deposit during the interest period.

1. The interest rate of the Waterloo Savings Bank is 2% yearly, payable on the first day of January, April, July, and October. Last year George Rider deposited $640 on April 1, $200 on May 27, and $100 on July 18. How much did he have on deposit on January 1 of this year if he made no withdrawals?

2. On February 4 of a certain year, Arthur Miller deposited $900 in the Dawson Savings Bank that paid 3% annually, interest being credited to depositors' accounts on January 1, April 1, July 1, and October 1. During the same year he deposited $150 on April 17 and $200 on August 11. If he made no withdrawals, what was his balance on October 1?

3. Walter Denny deposited $775 in the West End Savings Bank on April 1. On August 27 he withdrew $90, and on October 18 he deposited $175. What was the balance of his account on December 1 if the bank paid 2% annually, crediting interest on June 1 and December 1 of each year?

COMPOUND INTEREST

Nature of Compound Interest. When the interest for one interest period is added to the principal so that the sum becomes the new principal on which interest for the next period is calculated, and the process is repeated for any specified number of periods, the interest is said to be *compounded.*

The accumulated total at the close of the last interest period is the *compound amount;* and the difference between the compound amount and the original principal is the *compound interest* for the intervening time.

Interest may be compounded annually, semiannually, quarterly, or monthly.

Compound interest is rarely used in ordinary business transactions. It is used extensively, however, by banks, insurance companies, and investment institutions for calculating the cumulative value of a sum of money over a long period of time.

To Find the Compound Amount and the Compound Interest. The following steps are included in the calculation of the compound amount:

(1) Interest for the first period is calculated on the original principal.

(2) This interest is added to find the new principal.

(3) The interest for the second period is calculated on the new principal.

(4) Interest for each subsequent period is calculated on the sum of the principal outstanding during the previous period plus interest for that period.

If the interest is compounded more frequently than once a year, the given annual rate is divided by the number of compounding periods in a year to find the rate for each period. In the case of interest on savings accounts, the interest is usually computed on only the whole number of dollars in the principal. In all other situations involving compound interest, the interest for each period is computed on the full amount of the principal, including the cents.

Example: Robert Baxter, a college senior, borrows $550 from his uncle, James Cooper, to help defray the expenses of his senior year. He agrees to repay the loan at the end of two years, with interest at 2%, compounded semiannually. Find (a) the compound amount on the due date of the loan and (b) the compound interest.

Solution

(*a*) *Interest at 2%, compounded semiannually = 1% for each six months.*

Original principal	*$550.00*	
Int. for 1st period, 1% of $550.00	*5.50*	
New principal, end of 1st period	*555.50*	
Int. for 2d period, 1% of $555.50	*5.56*	
New principal, end of 2d period	*561.06*	
Int. for 3d period, 1% of $561.06	*5.61*	
New principal, end of 3d period	*566.67*	
Int. for 4th period, 1% of $566.67	*5.67*	
Compound amount, end of last period	*$572.34*	*Ans.*

(*b*) *$572.34, compound amount*
− *550.00, original principal*
$ 22.34, compound interest Ans.

The compound interest may be checked by adding the four interest items. Thus,

$5.50 + $5.56 + $5.61 + $5.67 = $22.34

Exercise 5. (*Written*)

Find the compound amount and compound interest in each:

1. $4,000 for 3 years at 6%, compounded annually
2. $3,000 for 4 years at 2%, compounded annually
3. $1,000 for 2 years at 5%, compounded semiannually
4. $800 for 2½ years at 5%, compounded semiannually
5. $300 for 1 year at 3%, compounded quarterly
6. $4,600 for 1 year at 1%, compounded quarterly

Problems for Application and Review

Group A

1. (a) $5.50 is what per cent smaller than $8.25? (b) Find the interest at 7% on $815.52 for 26 days. (c) $67.50 is 10% less than what amount? (d) $247.50 is what per cent greater than $225? (e) Express 85⅛% as a decimal.

2. A savings bank pays 2% interest on its deposits and adds the interest to the depositor's account on June 1 and December 1 of each year. On June 1, 1953, R. N. Williams deposited $300. If he made no additional deposits or withdrawals, how much did he have on deposit on December 1, 1955?

3. Mr. R. J. Todd purchased from the McClure Music Company a piano priced at $810, terms ⅓ down and the balance, plus a finance charge of $48.60, to be paid in 18 monthly payments. What is the amount of each monthly payment?

4. During one year a certain firm's sales were as follows: butter, $7,430; eggs, $8,310. The next year the sales were: butter, $6,980; eggs, $9,235. Find the per cent increase or decrease in sales for each commodity to the nearest tenth per cent.

Wed

Group B

1. (a) What amount increased by 35% of itself gives $23.22? (b) Find the interest at 5% on $709.61 for 27 days. (c) $2.25 is what per cent greater than $1.80? (d) $18.80 decreased by 37½% of itself gives what amount?

2. On June 30, 1954, Wall deposited $3,600 in a savings bank. The bank pays interest at the rate of 1½% annually, adding interest to the depositors' accounts on June 30 and December 31. How much did Wall have on deposit on July 1, 1955?

3. A mortgage amounting to $2,600 bears interest at 5¼% payable semiannually. What amount of interest is due on each interest date?

4. A 7% demand note for $550, dated October 5, was paid in full on December 12. What was the amount of the payment?

5. If the cost of the interest on a loan of $750 for 8 months is $20, what is the rate of interest?

Thurs.

Section 2 . . . Life Insurance

Purpose of Life Insurance. The primary purpose of life insurance is to protect one's dependents against financial loss in the event of his death. However, money placed in life insurance usually not only provides protection but also constitutes a saving. Most types of life insurance have a definite cash value, which increases from year to year. A person can withdraw this amount if he discontinues his insurance. This cash value also represents the amount he can borrow on his policy at any time.

Terms Used in Life Insurance. The contract between the person buying insurance and the insurance company is known as the *policy*. The individual protected by the policy is the *policyholder* or the *insured*. The insurance company is the *insurer*. The individual to whom the benefits are payable is the *beneficiary*.

The payment that must be made regularly to the insurance company for the protection afforded by the policy is known as the *premium*.

Kinds of Policies. There are several kinds of life insurance policies or contracts.

Term Insurance: This form of insurance carries the lowest premium rate but provides only temporary protection, usually five to ten years. At the expiration of most term policies, the insured receives nothing and has no further protection. If he wishes to extend his protection, he must obtain a new policy.

Whole Life or Ordinary Life Insurance: This is the most widely used form of life insurance. The person is insured for his entire lifetime and the premiums are payable until death or age 100. The premiums are less than for limited-payment or endowment insurance, as the premiums are paid over a longer period of time.

Limited Payment Life Insurance: The insured person pays a higher premium for a fixed period, such as 10, 20, or 30 years. After the last payment, he has no more premiums to pay but remains insured for the rest of his life.

Endowment Insurance: By paying a still higher premium for an endowment policy, the insured person is entitled to receive in cash the face value of the policy at the end of a specified period, such as 10, 20, or 30 years, meanwhile having insurance protection in the event of his death before the expiration of that time.

Annual Premium Rates. The table below shows the annual rates charged by one large company for $1,000 of life insurance under several types of policies taken out at various ages.

Annual Premium for $1,000 Insurance

Age at Issue	Kind of Policy		
	Ordinary Life	20-Pay. Life	20-Year Endow.
20	$16.44	$30.77	$50.52
25	18.66	33.41	50.89
30	21.48	36.46	51.54
35	25.02	40.11	52.71
40	29.65	44.46	54.57
45	35.59	50.05	57.74
50	43.28	57.07	62.51

To find the premium for any other amount of insurance, multiply the rate in the table by the number of thousands in the face of the policy. Thus, the premium for a $2,500 policy would be 2.5 times the rate shown in the table.

Semiannual and Quarterly Premium Rates. When the premiums are paid semiannually or quarterly, the annual cost is slightly greater than the annual rate. In the company whose annual rates are shown above, the annual rate is multiplied by .51 to obtain the semiannual rate and by .2625 to obtain the quarterly rate. The resulting rate is adjusted to the nearest cent.

Exercise 6. (*Written*)

The following problems are based on the annual premium rates in the table shown above. For semiannual rates multiply by .51; for quarterly rates, multiply by .2625.

1. Find the annual premium on each of the following policies:

Kind of Policy	Age	Face of Policy
(a) Ordinary Life	20	$7,000
(b) 20-Payment Life	30	$5,000
(c) 20-Year Endowment	25	$5,500
(d) Ordinary Life	30	$3,500
(e) 20-Payment Life	45	$6,500

2. Find the semiannual and quarterly premium rates per $1,000 on each of the following policies: (a) 20-payment life at age 40; (b) ordinary life at age 25; (c) 20-year endowment at age 25.

3. Leo Kent, aged 30, wishes to take out a 20-payment life policy and pay the premiums quarterly. (a) Find the quarterly premium rate per $1,000. (b) Find the quarterly premium he must pay on a $6,500 policy. (c) How much would he save each year by paying a single annual premium rather than four quarterly premiums?

4. John Becker, aged 35, takes out an ordinary life policy, electing to pay the premiums semiannually. (a) Find the semiannual premium rate per $1,000. (b) Find the semiannual premium he must pay if the face of the policy is $8,500. (c) How much would he save each year by paying a single annual premium rather than two semiannual premiums?

5. Paul Dean, aged 30, is planning to purchase a 20-year endowment policy of $7,000 and pay the premiums semiannually. (a) What will be the amount of each semiannual premium? (b) What will be the total of these premiums for the 20-year period?

Cash Surrender Value. All life insurance policies except term policies contain a table of cash surrender values which shows the amount of money the policyholder may receive if he cancels his policy. Two or three annual premiums must be paid before the policy has a cash value.

The table at the right shows for a few selected years the cash values of a $1,000 ordinary life policy taken out at age 25. They represent the cash values of a policy issued by the insurance company referred to above.

$1,000
ORDINARY
LIFE
AGE 25

END OF YEAR	CASH VALUE
1	$ 0
2	0
3	11
6	55
10	117
15	198
20	284

Dividends. Many companies distribute part of their earnings to the policyholders in the form of dividends. When the policyholder receives notice of premium due, he also receives notice of the amount of the dividend. The policyholder may (1) take the dividend in cash, (2) deduct it from the premium due, or (3) leave it with the company for the purchase of additional insurance or to earn interest.

Group Insurance. Employees of a single concern often obtain life insurance under a master policy covering the entire group. This is known as *group life insurance.* The premium is usually less than that for a policy of similar amount taken out individually by the members of the group. The employer usually pays part or all of the premiums.

Accident and health, and hospitalization insurance are also obtainable under a group plan.

Exercise 7. (Written)

1. At age 25, Leon Bell took out an ordinary life policy for $8,000. At the end of 6 years he turned in the policy for its cash value of $55 per $1,000. How much money did he receive?

2. Mabel Harris carries a life insurance policy for $3,000 at an annual rate of $17.08 per $1,000. This year her policy earned a dividend of $7.17, which she will use to reduce her next premium. What amount will she send to the insurance company when she makes her next premium payment?

3. Earl Bowen has an insurance policy for $5,000, on which he has paid annual premiums at the rate of $24.40 per $1,000 for 20 years. Over this period, dividends have amounted to $73.20; and he has used them to reduce the premiums. What has been his average annual net payment to the insurance company over the 20-year period?

4. Louis Ives took out an ordinary life policy at age 25 for $5,000 at the annual premium rate of $18.66 per $1,000. At the end of 10 years he turned in the policy for its cash value of $117 per $1,000. Over this period, dividends amounted to $91.40 and were used to reduce the premiums. (a) What was the total amount he paid the insurance company during the 10 years the policy was in force? (b) How much money did he receive when he turned in the policy? (c) What was the net cost of the insurance protection for 10 years? (d) What was the average annual net cost per $1,000?

Problems for Application and Review

1. (a) Express 116% as a mixed number in lowest terms. (b) Find the interest at 7% on $954.66 for 26 days. (c) What amount increased by 150% of itself gives $90? (d) Express $1\frac{3}{4}\%$ as a decimal. (e) Using the four-step process multiply $20\frac{2}{3}$ by $9\frac{1}{4}$.

2. Roy Sears carries a life insurance policy for $6,000 at an annual rate of $23.34 per $1,000. This year his policy earned him a dividend of $16.15, which he will be allowed to deduct from his next premium. What net amount will he send to the insurance company as payment for his next year's premium?

3. A salesman working on an 8% straight-commission basis earned $7,000 last year. What was the value of the goods he sold?

4. A 5% note for $350 dated May 10 was paid in full on July 16. What was the amount of the July 16 payment?

5. If $37.50 interest is charged on a loan of $750 for 15 months, what is the rate of interest?

Section 3 . . . Investments in Bonds

Types of Investments. Persons who have accumulated savings in excess of their probable emergency needs may wish to place their surplus funds in investments that offer higher rates of interest than can be obtained in savings banks. Some of the more common types of investment for surplus funds are bonds, stocks, and real estate.

Nature of a Bond. A *bond* is a form of long-term promissory note that is issued by a government or a corporation for the purpose of borrowing money.

If a corporation wishes to borrow a large sum of money for a long period of time, the loan may be divided into parts. Each part is represented by a bond, which is the corporation's written promise to repay the money, with interest, on a specified future date.

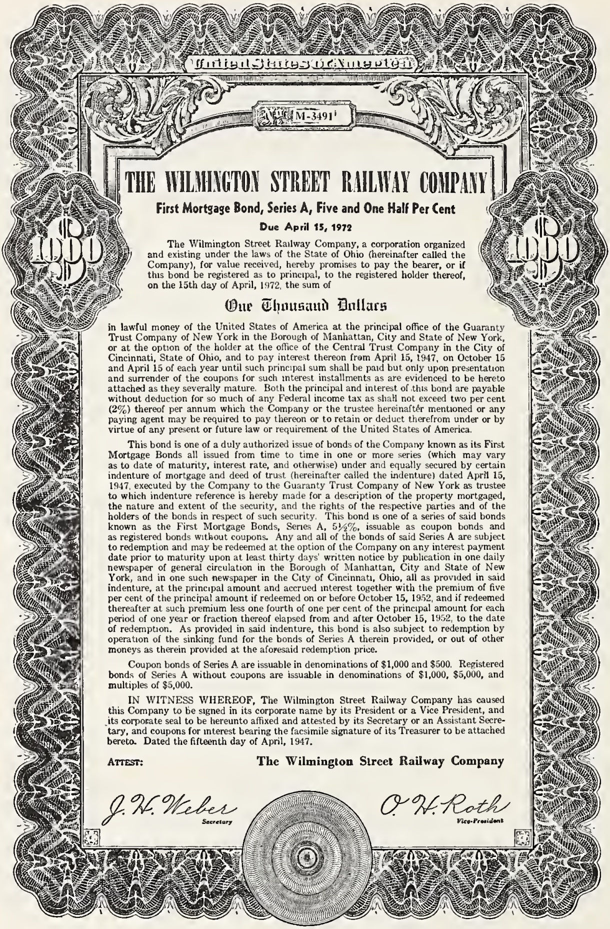
For example, if a corporation such as the United States Steel Corporation wishes to borrow $100,000,000 for ten years, it may issue 100,000 ten-year bonds, each with a face value of $1,000. Persons who are willing to lend money to the corporation may buy one or more of the bonds. Those who purchase the bonds are referred to as *bondholders* of the corporation.

Money in large amounts may be borrowed in the same manner by the Federal Government and by smaller governmental units, such as states, counties, cities, and towns.

Bonds are usually issued in denominations (face value) of $1,000. In order to attract small investors, bonds are sometimes issued in $50, $100, and $500 denominations.

An illustration of a corporation bond is shown on page 194. By reading the face of this bond you will see that the bond is a written promise to pay a definite sum of money, $1,000, on a specified date, April 15, 1972. It also contains an agreement to pay interest at a specified rate, $5\frac{1}{2}\%$, at certain intervals, on October 15 and April 15 of each year.

The security for an issue of corporation bonds is often a mortgage on the company's property, such as its land, buildings, or equipment. The mortgage agreement is executed between the corporation and a bank or trust company, called the *trustee*, which is appointed by the corporation to represent the bondholders as a group in their transactions with the corporation.



United States of America

No. M-3491

THE WILMINGTON STREET RAILWAY COMPANY

First Mortgage Bond, Series A, Five and One Half Per Cent

Due April 15, 1972

The Wilmington Street Railway Company, a corporation organized and existing under the laws of the State of Ohio (hereinafter called the Company), for value received, hereby promises to pay the bearer, or if this bond be registered as to principal, to the registered holder thereof, on the 15th day of April, 1972, the sum of

One Thousand Dollars

in lawful money of the United States of America at the principal office of the Guaranty Trust Company of New York in the Borough of Manhattan, City and State of New York, or at the option of the holder at the office of the Central Trust Company in the City of Cincinnati, State of Ohio, and to pay interest thereon from April 15, 1947, on October 15 and April 15 of each year until such principal sum shall be paid but only upon presentation and surrender of the coupons for such interest installments as are evidenced to be hereto attached as they severally mature. Both the principal and interest of this bond are payable without deduction for so much of any Federal income tax as shall not exceed two per cent (2%) thereof per annum which the Company or the trustee hereinafter mentioned or any paying agent may be required to pay thereon or to retain or deduct therefrom under or by virtue of any present or future law or requirement of the United States of America.

This bond is one of a duly authorized issue of bonds of the Company known as its First Mortgage Bonds all issued from time to time in one or more series (which may vary as to date of maturity, interest rate, and otherwise) under and equally secured by certain indenture of mortgage and deed of trust (hereinafter called the indenture) dated April 15, 1947, executed by the Company to the Guaranty Trust Company of New York as trustee to which indenture reference is hereby made for a description of the property mortgaged, the nature and extent of the security, and the rights of the respective parties and of the holders of the bonds in respect of such security. This bond is one of a series of said bonds known as the First Mortgage Bonds, Series A, 5½%, issuable as coupon bonds and as registered bonds without coupons. Any and all of the bonds of said Series A are subject to redemption and may be redeemed at the option of the Company on any interest payment date prior to maturity upon at least thirty days' written notice by publication in one daily newspaper of general circulation in the Borough of Manhattan, City and State of New York, and in one such newspaper in the City of Cincinnati, Ohio, all as provided in said indenture, at the principal amount and accrued interest together with the premium of five per cent of the principal amount if redeemed on or before October 15, 1952, and if redeemed thereafter at such premium less one fourth of one per cent of the principal amount for each period of one year or fraction thereof elapsed from and after October 15, 1952, to the date of redemption. As provided in said indenture, this bond is also subject to redemption by operation of the sinking fund for the bonds of Series A therein provided, or out of other moneys as therein provided at the aforesaid redemption price.

Coupon bonds of Series A are issuable in denominations of $1,000 and $500. Registered bonds of Series A without coupons are issuable in denominations of $1,000, $5,000, and multiples of $5,000.

IN WITNESS WHEREOF, The Wilmington Street Railway Company has caused this Company to be signed in its corporate name by its President or a Vice President, and its corporate seal to be hereunto affixed and attested by its Secretary or an Assistant Secretary, and coupons for interest bearing the facsimile signature of its Treasurer to be attached hereto. Dated the fifteenth day of April, 1947.

ATTEST: **The Wilmington Street Railway Company**

J. H. Weber
Secretary

O. H. Roth
Vice-President

Bond

Marketing a Bond Issue. When money is borrowed by issuing bonds, the entire issue is usually sold to an *investment banking house*. The banking house sells the bonds to individual investors at a slight advance in price over that which is paid for them.

For example, a corporation may issue 100,000 bonds, each with a face value of $100. The banking house may buy them from the corporation at $99 each and perhaps sell them to investors at $101.

Par Value and Market Value of a Bond. Two kinds of value used in referring to a bond are par value and market value.

The *par value* of a bond is its face value, or the amount that appears on the face of the bond. It is the amount that the borrower promises to pay the bondholder at maturity. For example, the par value of the bond illustrated on page 194 is $1,000.

The *market value* of a bond is the price at which the bond is currently being sold. The market value may or may not be the same amount as the par value. If the market value is greater than the par value, the bond is said to be selling at a *premium;* if the market value is less than the par value, it is said to be selling at a *discount*. The amount of the premium or discount is the difference between the market value and the par value.

How the Market Price of a Bond Is Quoted. The market price, or market value, of a bond is quoted as a certain per cent of the par value. For example, a price quotation of "98¾" means 98¾% of the par value of the bond. The market price of the bond is therefore found by multiplying the par value by the per cent.

Thus, if the investment house of Orvis & Company offers Western Steel Corporation bonds at 98¾, the price of one of the corporation's $1,000 bonds is 98¾% of $1,000, or $987.50.

$$.98\tfrac{3}{4} \times \$1{,}000 = \$987.50$$

Similarly, if the quoted price of a bond is 102½, the price of a $1,000 bond would be 102½% of $1,000, or $1,025.

$$1.02\tfrac{1}{2} \times \$1{,}000 = \$1{,}025$$

Likewise, if the quoted price is 102½, the price of a $500 bond would be 102½% of $500, or $512.50.

$$1.02\tfrac{1}{2} \times \$500 = \$512.50$$

To Find the Amount of an Investment in Bonds When the Market Price and the Number of Bonds Purchased Are Given. To find the amount of an investment in bonds, purchased from an investment banking firm, find the price of one bond and multiply that amount by the number of bonds purchased.

Example: Philip Morgan, an investor, purchased from the investment banking house of Fields & Company eight $1,000 Consolidated Electric Company bonds at $101\frac{5}{8}$. What is the amount of his investment in the bonds?

Solution

$101\frac{5}{8}\% = 1.01\frac{5}{8}$

$1.01\frac{5}{8} \times \$1{,}000 = \$1{,}016.25$, *market price of 1 bond*

$8 \times \$1{,}016.25 = \$8{,}130.00$, *total investment*

Exercise 8. (*Written*)

1. Herbert Wideman purchases from an investment banking house twelve $1,000 National Paper Corporation bonds at $97\frac{3}{8}$. (a) What is the price of one bond? (b) What is the amount of his investment in the bonds?

2. George Turner purchased seven $100 Pinedale Realty Corporation bonds at $102\frac{1}{2}$. (a) What was the price of one bond? (b) What amount did he invest in the bonds?

3. An investor purchased three $500 City Transit Company bonds at $99\frac{1}{2}$. What was the amount of his investment?

4. Alfred Olsen purchased four $1,000 bonds and one $500 bond of the Premier Theaters Corporation at $101\frac{3}{4}$. How much did he invest?

5. What amount did Shirley Scott invest if she purchased one $500 bond and four $100 bonds at $96\frac{1}{2}$?

6. What was Fred Gray's total investment if he purchased three $500 bonds at $108\frac{3}{4}$ and five $1,000 bonds at $92\frac{7}{8}$?

Buying Bonds through a Broker. After a bond issue has been sold by an investment banking house, a person who wishes to buy one or more of the bonds must obtain them from a present bondholder who wishes to sell his holdings. Likewise, a bondholder who wishes to dispose of his holdings must sell them to some investor who wishes to purchase them. The transaction is seldom carried out directly between the buyer and seller because in most cases the two parties live at widely separated points and are unknown to each other. Such purchases and sales are usually made through agents, known either as *bond brokers* or *stockbrokers*. The buyer and the seller each places an order with his local broker to buy or tell a particular bond either at a stated price or at the current market price. Each broker telegraphs his order to his representative on one of the stock exchanges, such as the New York Stock Exchange, where orders to buy or sell are received from brokers in various parts of the country and where the orders are actually executed. The sellers are required to surrender their bonds to their local brokers, who make the necessary arrangements for the transfer of ownership of the bonds.

Brokerage Fee. When bonds are bought or sold through a broker, the broker charges a commission, or *brokerage fee.* For bonds of $1,000 denomination, selling at $100 or above, the brokerage varies from $5.00 for one bond to $2.50 per bond for five or more bonds. A lower brokerage fee is charged for bonds of lower denominations.

To Find the Amount of an Investment in Bonds When the Market Price, Brokerage Fee, and Number of Bonds Are Given. When bonds are purchased through a broker, the amount of the investment is the market price of the bonds plus the cost of the brokerage.

Example: Albert F. White expects to purchase through a broker five $1,000 Baltimore & Ohio Railroad bonds at $96\frac{3}{8}$ plus $2.50 brokerage fee per bond. What will be the amount of his investment?

Solution

$.96\frac{3}{8} \times \$1{,}000 = \$963.75$, *market price of 1 bond*

Investment:

$5 \times \$963.75 = \$4{,}818.75$, *market price of 5 bonds*

$5 \times \$2.50 = \underline{\quad 12.50}$, *brokerage on 5 bonds*

$\$4{,}831.25$, *total investment* *Ans.*

The amount of the investment may be computed also by first finding the investment in one bond, including the brokerage, and then multiplying that amount by the number of bonds purchased. Thus,

$.96\frac{3}{8} \times \$1{,}000 = \$963.75$, market price of 1 bond

$\underline{\quad 2.50}$, brokerage on 1 bond

$\$966.25$, investment in 1 bond

$5 \times \$966.25 = \$4{,}831.25$, total investment

Exercise 9. (*Written*)

1. Thomas Nichols purchases through a bond broker ten Bethlehem Steel Corporation bonds (par value $1,000) at $101\frac{7}{8}$ plus $2.50 brokerage fee per bond. What is the amount of his investment in the bonds?

2. An investor purchased six $1,000 bonds at $92\frac{1}{2}$; brokerage fee $2.50 per bond. What was the amount of his investment?

3. Leon Cowles purchased eight $1,000 bonds at $975 each. If the cost of the brokerage was $20, what was his total investment in the bonds?

4. How much money did John Agnew invest in twelve $1,000 bonds that he purchased at $1,027.50 each, brokerage $30?

5. Claude Wing purchased seven $1,000 bonds at $95\frac{7}{8}$ and three $500 bonds at $87\frac{3}{4}$. What was his total investment in the ten bonds?

When the brokerage is not stated, assume that it is included in the quoted price.

Problems for Application and Review

Group A

1. (a) $3.30 is what per cent greater than $1.98? (b) Find the interest at $4\frac{1}{2}\%$ on $537.95 for 29 days. (c) $7.92 is 75% of what amount? (d) $54.24 minus 25% of itself leaves what amount? (e) What amount multiplied by $\frac{1}{2}$ gives $7.80?

2. How much did A. C. Brock invest in eight $1,000 Hartford Electric Company bonds at $94\frac{1}{2}$ plus $2.50 brokerage fee per bond?

3. How much did Harry Palmer invest in seven $500 bonds that he purchased at $89\frac{3}{4}$ plus a brokerage fee of $2 per bond?

4. A savings bank pays interest at the rate of $2\frac{1}{2}\%$ annually and adds the interest to the depositor's account on January 1 and July 1 of each year. E. C. Weller deposited $200 on July 1, 1952, and $150 on January 1, 1953. How much did Weller have on deposit on January 1, 1954, if he made no withdrawals?

5. A real estate agent sold a piece of property for Ross for $18,900. How much did Ross receive if the agent deducted $182.50 for expenses and $4\frac{1}{2}\%$ for commission?

Group B

1. (a) What amount is 25% less than $35.48? (b) Find the interest at $4\frac{1}{2}\%$ on $495.25 for 37 days. (c) $10.80 is what per cent smaller than $18? (d) $29.40 increased by 25% of itself gives what amount? (e) Express $2\frac{3}{4}\%$ as a decimal.

2. An investor bought three $1,000 bonds at $108\frac{7}{8}$ plus $4 brokerage fee per bond. What was his total investment?

3. An investor bought twelve $500 bonds at $103\frac{3}{4}$ plus $1.25 brokerage per bond. What was his total investment?

4. A real estate agent, on a 5% commission basis, received $500 for selling a piece of property. What was the selling price of the property?

5. Fred Warner borrows $80 from a credit union, to be repaid at the rate of $20 a month plus interest at $1\frac{1}{4}\%$ on the unpaid balance. What will be the total interest cost?

Group C

1. (a) $2.40 is what per cent greater than $1.92? (b) Find the interest at $7\frac{1}{2}\%$ on $374.17 for 38 days. (c) What amount minus 4% of itself gives $26.40? (d) $26.60 plus 25% of itself gives what amount? (e) Find the number of days from April 2 to July 24.

2. An investor purchased twelve $1,000 bonds at $122\frac{5}{8}$. The brokerage charge on the transaction was $30. What was his total investment in the bonds?

3. The Federal Savings Bank pays interest on deposits at the rate of $1\frac{1}{2}\%$ annually. It adds interest to the depositors' accounts on April 1 and October 1. On October 1, 1951, Clarkson deposited $460. On October 1, 1952, he made an additional deposit of $120. (a) How much did Clarkson have on deposit on April 1, 1953? (b) How much interest was added to his account from October 1, 1951, to April 1, 1953?

4. A sales clerk receives a salary of $35 per week and a commission of 5% on all sales in excess of $600 in any single week. What must be the amount of her sales each week in order that her total weekly earnings may be $45?

5. A 5% mortgage for $4,000, dated May 1, requires the semiannual payment of interest together with a payment of $100 on the principal. What amount will be due for payment at the end of the third year, counted from the date of the mortgage?

Bond Interest. Interest is paid on bonds at regular intervals, usually semiannually.

The interest payment on a bond may be made by check, which is mailed by the corporation or the trustee to the bondholder; or the bond may have attached to it a sheet of interest coupons containing one coupon for each interest date. The holder of the bond cuts off each coupon on the day on which the interest is due and deposits it with his local bank for collection.

The interest rate on a bond is always based on the par value. In other words, in applying the interest formula, *Principal* × *Rate* × *Time* = *Interest,* the par value is the principal.

For example, the interest for one year on a $1,000, 5% bond would be:

$1,000 × .05 = $50, interest for 1 year

If the interest is paid semiannually, the amount of each interest payment would be $25, calculated as follows:

$1,000 × .05 × $\frac{1}{2}$ = $25, semiannual interest

To Find the Income from an Investment in Bonds When the Number of Bonds Owned Is Given. To find the amount of a bondholder's income, first find the amount of interest on one bond. Then multiply that result by the number of bonds owned.

Exercise 10. (*Written*)

1. If the interest is payable on February 1 and August 1, what is the amount of each interest payment on a $500 bond bearing interest at 3½%?

2. What is the amount of each interest payment on a $1,000, 4¾% bond if the interest is payable semiannually, on June 1 and December 1?

3. What amount of interest is received on each interest date by a bondholder who owns nine $1,000 bonds bearing interest at 3¼%, payable semiannually?

4. George Sloane owns four $1,000 bonds and one $500 bond of the Municipal Power & Light Corporation, each bearing interest at 4½%. If the interest is payable semiannually, what total amount does he receive on the interest date?

5. What will be the annual income from fifteen bonds having a par value of $1,000 each and paying $3\frac{3}{4}\%$ interest?

6. What is the annual income on seven $1,000, $5\frac{1}{4}\%$ bonds?

Exercise 11. (Written)

1. An investor purchased eleven $1,000 bonds, bearing $2\frac{3}{4}\%$ interest, at 96 plus $2.50 brokerage fee per bond. (a) How much did he invest in the bonds? (b) What is his annual income from the investment?

2. M. G. Hanna purchases seven $1,000, $5\frac{1}{4}\%$ bonds at $101\frac{1}{8}$, plus brokerage at $2.50 per bond. (a) What is his total investment in the bonds? (b) What will be his annual income from the investment?

3. (a) What is the annual income from fifteen $2\frac{7}{8}\%$ bonds (par value $1,000) purchased at $1,122.50 each, brokerage included? (b) What is the amount of the investment?

4. An investor purchased six $1,000, $4\frac{1}{2}\%$ bonds at $114\frac{3}{8}$, including brokerage, and five $500, 5% bonds at $97\frac{1}{2}$, including brokerage. (a) How much money did he invest in the eleven bonds? (b) What annual income does he receive from the investment?

5. (a) What is the annual income from an investment in three $500, $4\frac{1}{2}\%$ bonds purchased at $99\frac{1}{4}$? (b) What is the amount of the investment?

To Find the Rate of Income on Investment. Before making an investment, the investor should ascertain what rate of income, or return, he will receive on the investment. Rate of income on investment is the annual income, or interest, expressed as a per cent of the investment. It answers the question: The annual income is what per cent of the amount invested?

The annual income therefore represents the part; and the amount invested represents the base, or whole, with which the part is compared. Hence the formula:

$$\textbf{Rate of Income} = \frac{\textbf{Annual Income}}{\textbf{Investment}}$$

The term "yield" is often used in referring to the income on an investment. For example, if it is said that the "yield" on a certain investment is 5% or that a certain investment "yields" 5%, it means that the investment produces an annual income equivalent to 5% of the amount invested.

Exercise 12. (Written)

1. Frank Williams expects to purchase eight $1,000 National Sugar bonds, bearing 6% interest, at 97¼; brokerage, $2.50 per bond. What rate of income will he receive on his investment, calculated to the nearest hundredth per cent?

Since each of the eight bonds bears the same rate of interest and is bought at the same market price, the rate of income on all the bonds will be the same as the rate of income on one bond. Hence the rate of income on the investment may be found by dividing the annual interest income from one bond by the investment in one bond.

2. Harry Simon purchased three $1,000, 4% bonds at 94¼ plus $4.00 brokerage fee per bond. What rate of income, to the nearest hundredth per cent, does he receive on his investment?

3. An investor bought twenty-five $1,000, 5% bonds at $1,027.50 each, plus $2.50 brokerage fee per bond. Find to the nearest hundredth per cent the rate of income on the investment.

4. Timothy Lane purchased eight $1,000 bonds, bearing 3⅜% interest, at 103½, and twelve $1,000 bonds, bearing 4½% interest, at 98. (a) Find the amount of his investment in the twenty bonds. (b) Find his total annual income from the investment. (c) Find the rate of return on the total investment, to the nearest tenth per cent.

Divide the total annual income from the twenty bonds by the total investment in the twenty bonds to find the rate of income on the investment.

5. Robert Higgins owns $10,000, par value, of 3¾% bonds which he purchased at 101½, and $15,000, par value, of 4½% bonds which he purchased at 97. What rate per cent of income does he receive on the total investment, to the nearest tenth per cent?

To Find the Annual Income, Given the Rate of Income and the Investment. Rate of income is always based on the investment. This means that the amount of the income is the product of the rate of income multiplied by the investment.

For example, if Henry Griffith obtains 5% income on a bond investment amounting to $4,400, his annual income from the investment is 5% of $4,400, or $220.

Expressed as a formula,

Rate of Income × Investment = Income

Exercise 13. (*Written*)

1. R. M. Shaffer obtains 4% income on a bond investment of $23,250. What is his annual income from the investment?

2. Lester Osgood invested $10,400 in General Container Corporation $1,000 bonds. What is the amount of his annual income if he realizes 3¾% income on the investment?

3. J. D. Leary purchased one $1,000 Defiance Copper Company bond at 75, brokerage included, which yields 4% income on the investment. What is the amount of his annual income from the bond?

4. An investor owns one $1,000 bond which he purchased at 125, including the brokerage, and which yields a return of 4% on the investment. How much does he receive annually from the investment?

To Find the Investment, Given the Annual Income and the Rate of Income. In every problem in which the rate of income is given, the amount of the income is the product of the investment and the rate. That is,

$$\textbf{Rate of Income} \times \textbf{Investment} = \textbf{Income}$$

The rate of income and the investment represent the factors, and the income represents the product. If only the income and the rate of income are given in a problem, the unknown factor (Investment) may be found by dividing the product (Income) by the known factor (Rate of Income). Hence,

$$\textbf{Investment} = \textbf{Income} \div \textbf{Rate of Income}$$

or

$$\textbf{Investment} = \frac{\textbf{Income}}{\textbf{Rate of Income}}$$

Exercise 14. (*Written*)

1. If an investor desires a return of 5% on his investment, what is the highest price, including brokerage, he should pay for a 6%, $1,000 bond?

Find the annual income, which is 6% of $1,000. Then divide that result by the desired rate of income, 5%.

2. An investor wishes to realize 5% on his investment. What is the highest price, including brokerage, he can afford to pay for a $1,000 bond if the bond bears interest at 5¼%?

3. What is the highest price, including brokerage, that may be paid for a $2\frac{1}{4}\%$ bond, par value $1,000, if the investor desires a yield of 2% on his investment?

4. At what price, including brokerage, should a 2% bond be purchased to yield $2\frac{1}{2}\%$ on the investment?

5. If Newton Gas and Electric bonds can be purchased at a price that yields 4% on the investment, what amount must be invested in these bonds in order to obtain an annual income of $300?

To Find the Number of Bonds Purchased or Owned. If the price of one bond and the total amount invested are known, the number of bonds purchased may be found by dividing the total investment by the investment in one bond.

If the interest on one bond and the total income from the investment are known, the number of bonds owned may be found by dividing the total income by the interest on one bond.

Exercise 15. (*Written*)

1. Richard Young invested $12,300 in $1,000 Milford Gas and Electric Company bonds at $102\frac{1}{4}$ plus $2.50 brokerage fee per bond. (a) What was his total investment in one bond? (b) How many bonds did he purchase?

Divide the total investment by the investment in one bond to find the number of bonds purchased.

2. Donald Borden invested $23,400 in Sentry Company bonds that he purchased at $975 each, including brokerage. How many bonds did he buy?

3. Ralph Yates purchased Chase Sugar Company bonds at $852.50, plus $2.50 brokerage fee per bond. If his investment in the bonds amounted to $13,680, how many bonds did he purchase?

4. From an investment in Southeastern Corporation 5% bonds, par value $1,000, Walter Short receives an annual income of $650. (a) What is the annual interest he receives on one bond? (b) How many bonds does he own?

Divide the total income by the interest on one bond to find the number of bonds he owns.

5. From an investment in 3% bonds, par value of each bond $1,000, Roy Ingalls receives an annual income of $840. How many bonds does he own?

6. If Oliver Irving receives an annual income of $1,550 from an investment in 5% bonds, each with a par value of $1,000, how many bonds does he own?

Problems for Application and Review

Group A

1. (a) Multiply $15,000 by .0425. (b) $23.78 is 45% more than what amount? (c) Divide 990 by 22,000. (d) Find the interest on $719.50 for 40 days at 6%. (e) $877.40 is what per cent of $16,400? (f) $38.40 increased by 37½% of itself equals what amount? (g) Find the interest at 6% on $378.53 for 69 days.

2. How much did C. J. Gilbert invest in four $1,000 bonds that he purchased at 92⅛ plus a brokerage fee of $3 per bond?

3. How much did A. R. Cox invest in seven $500 bonds at 97¾ if the brokerage charge on the transaction was $14?

4. If six $1,000 bonds bearing interest at 4¾% are purchased at 95, including brokerage, what will be the rate of income on the investment?

5. C. M. Conover owns $8,000, par value, of 3¾% bonds. What is the amount of his annual income from the investment?

6. An investor purchased Western Utilities bonds, each having a par value of $1,000, at 135½ plus a brokerage fee of $2.50 per bond. How many bonds did he purchase if the amount he invested was $16,290?

Group B

1. (a) $1.80 is what per cent greater than $1.44? (b) Multiply $13,000 by .82125. (c) Find the interest on $598.25 for 46 days at 6%. (d) Divide 52.5 by 840. (e) $1,404 is what per cent of $13,000? (f) Find the interest at 6% on $402.60 for 79 days. ✓

2. If eight $500 bonds bearing interest at 4½% are purchased at 125, what will be the rate of return on the investment?

3. An investor owns $12,500, par value, of 4½% bonds that he purchased at 122⅜. What is the amount of his annual income from the investment?

4. M. C. Thomas purchased three $1,000, 4% bonds at 108¾ plus a $4 brokerage fee per bond and two $1,000, 3½% bonds at

99½ plus a brokerage fee of $5 per bond. What rate of income, to the nearest tenth per cent, does he receive on his total investment?

5. How many $500, 4½% bonds does Alice Miller own if her annual income from the bonds amounts to $90?

6. The Monroe Savings Bank pays 1½% interest annually on its deposits and adds the interest to the depositors' accounts on June 1 and December 1 of each year. On June 1, W. C. Jones deposited $600. He withdrew $200 on December 1 of the same year. How much did Jones have on deposit on June 1 of the following year?

7. George Nutter borrows from a loan company $125, to be repaid at the rate of $25 a month plus interest at 3% a month on the unpaid balance. What will be the total interest cost?

Group C

1. (a) $291.20 is 65% of what amount? (b) Multiply $14,000 by 1.1675. (c) Find the interest at 6% on $622.12 for 47 days. (d) $2.25 is what per cent smaller than $3.60? (e) Divide 67.5 by 1,800. (f) Find the interest on $533.18 for 89 days at 6%.

2. An investor purchased six $1,000, 3% bonds at 112¾ plus a brokerage fee of $2.50 per bond and four $1,000, 2½% bonds at 88½ plus a brokerage fee of $3 per bond. What is his rate of income on the total investment, computed to the nearest tenth per cent?

3. Clarence Safford invested $18,525 in Emerson Metal Company $1,000 bonds that he purchased at 92⅜ plus a $2.50 brokerage fee per bond. How many bonds did he buy?

4. What should be the owner's asking price for a piece of property if he desires to realize $8,400 on the sale after reducing his asking price $500 and paying the real estate agent a commission of 4% for completing the sale?

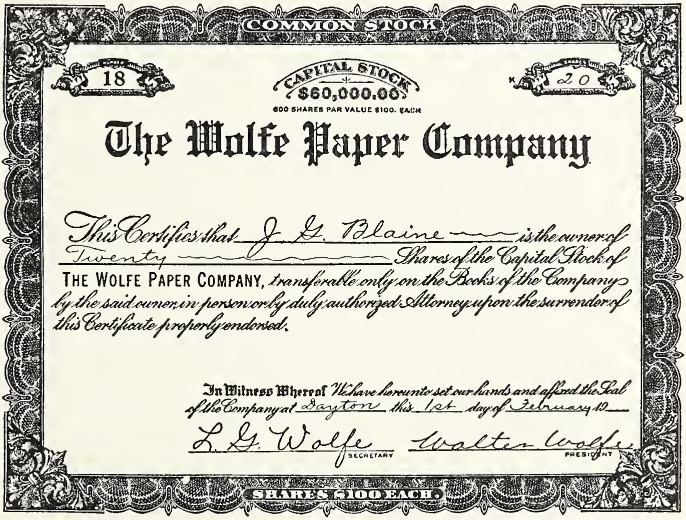
5. A man borrowed $650 and repaid it with interest at the end of four months. What rate of interest did he pay if the interest amounted to $9.75?

6. Find (a) the date of maturity and (b) the total amount due on the date of maturity of a 60-day note for $675, dated May 25, and bearing interest at 5%.

7. (a) What are the proceeds of a 70-day non-interest-bearing note for $765, dated June 13, which is discounted at the bank on June 13 at 6%? (b) What is the due date of the note?

Nature of Corporation Stock. Instead of raising money by issuing bonds, a corporation may obtain the needed funds by issuing additional shares of capital stock. For example, a company in need of $1,000,000 for the expansion of its plants and manufacturing facilities, might decide to issue and sell 10,000 shares of stock at $100 a share. The investors who buy the shares are known as *stockholders* of the corporation. Each stockholder receives from the company a paper, called a *stock certificate,* which states on its face the number of shares he owns. Each certificate is registered with the corporation in the name of the owner.

An illustration of a stock certificate is shown below. By reading the face of this certificate you will see that J. G. Blaine is the owner of twenty shares of the capital stock of The Wolfe Paper Company.



COMMON STOCK

18

CAPITAL STOCK
$60,000.00
600 SHARES PAR VALUE $100. EACH

20

The Wolfe Paper Company

This Certifies that J. G. Blaine *is the owner of* Twenty *Shares of the Capital Stock of* THE WOLFE PAPER COMPANY, *transferable only on the Books of the Company by the said owner in person or by duly authorized Attorney upon the surrender of this Certificate properly endorsed.*

In Witness Whereof *We have hereunto set our hands and affixed the Seal of the Company at* Dayton *this* 1st *day of* February *19*

L. G. Wolfe
SECRETARY

Walter Wolfe
PRESIDENT

SHARES $100 EACH.

Stock Certificate

When a corporation raises money by issuing stock, it does not promise to repay the amount at some future date as it does when issuing bonds, nor does it promise to pay interest. The money obtained from the sale of stock becomes a part of the permanent capital of the corporation. Hence, when an investor purchases a share of stock, he buys a part ownership in the corporation. As a part owner or stockholder, he is entitled to a proportionate share of the profits of the corporation. The profits that the corporation distributes to its stockholders are known as *dividends*. Dividends may be paid quarterly, semiannually, or annually. Among the larger, nationally known corporations it is common practice to pay dividends quarterly.

Marketing a Stock Issue. An issue of stock is marketed in much the same manner as an issue of bonds. The entire issue is generally sold to an investment banking house. The banking house then sells the shares to individual investors at a somewhat higher price than it paid for them.

Par Value and Market Value of Stock. The *par value* of a share of stock is a value that the corporation assigns to the shares before they are issued. By reading the stock certificate shown on page 207, you will see that the par value of each of the shares of The Wolfe Paper Company is $100.

All the shares of a given issue of stock have the same par value. This value may be $1, $10, $25, $50, or $100, or any other value that the corporation may decide to assign to the shares. It is seldom more than $100, however. Many corporations issue stock without assigning any value to the shares. Such stock is referred to as *no-par*, or *no-par-value*, stock.

The *market value* of a share of stock is the price at which the stock is currently being sold. Under the laws of several states, a corporation is not permitted to sell its shares for less than the par value. After the corporation has disposed of the issue, investors may buy and sell the shares at any price they agree upon. The price that investors may be willing to pay for the shares at any particular time is governed largely by their estimate of the future earning power of the corporation.

How the Market Price of a Stock Is Quoted. The market price, or market value, of a share of stock is usually quoted as so many dollars per share. For example, a quotation of "$26\frac{3}{4}$" means \$$26\frac{3}{4}$. The price of one share is therefore $26.75.

Buying and Selling Stock through Brokers. After a stock issue has been sold by the investment banking house, investors who wish to buy shares in the corporation must obtain them from present stockholders who may wish to sell their holdings. Such purchases and sales are usually made through stockbrokers in the same manner as purchases and sales of bonds, as explained on page 196.

The sellers of the stock are required to surrender their stock certificates to their respective brokers. The latter make the necessary arrangements for the transfer of the ownership of the shares.

Brokerage Fees and Transfer Taxes. A person who buys or sells stock through a broker is charged a commission, or brokerage fee, for the stockbroker's services. On the New York Stock Exchange, the commission charges on a 100-share lot, based on the total market value of the shares, are as follows:

Market Value	*Commission*
If less than $ 100.00	6%
$ 100.00 to 999.99	1% plus $ 5.00
$1,000.00 to 3,999.99	$\frac{1}{2}$% plus 10.00
$4,000.00 and above	$\frac{1}{10}$% plus 26.00

Thus, if W. E. Rose buys 100 shares of stock at $30, the market value of the shares is $3,000. The commission is therefore $10 + $\frac{1}{2}$% of $3,000, which is $10 + $15, or $25.

When two or more 100-share lots are bought or sold, the commission on 100 shares is calculated first and that amount is multiplied by the number of lots. For example, if Mr. Rose should buy 300 shares of stock at $30, the commission would be 3 × $25, or $75.

In addition, the seller of stock is required to pay a Federal transfer tax and, in some states, a state tax on the shares sold. The buyer of stock is not required to pay any taxes when he buys in even 100-share lots. He must, however, pay a Federal transfer tax on any fractional part of 100 shares that he purchases.

To Find the Total Cost of a Purchase of Stock. The total cost, or gross cost, of a purchase of stock is the sum of the market price, the brokerage, and the transfer taxes, if any.

Market Price + Brokerage + Taxes = Total Cost

If fewer than 100 shares are bought, the commission is 10% less than the amount computed by using the rates in the table.

Example: W. H. Brooks bought through a broker 50 shares of Dixie Portland Cement stock at 34. Find the total cost of the stock if the commission was based on the table of rates shown on page 209, less 10%, and if 6¢ a share was charged for transfer taxes.

Solution

Market value, $34 × 50			*$1,700.00*
Commission:			
$\frac{1}{2}$% of $1,700.00	*$ 8.50*		
Plus	*10.00*	*$18.50*	
Less 10% of $18.50		*1.85*	*16.65*
Transfer taxes, $.06 × 50			*3.00*
Total cost			*$1,719.65 Ans.*

Exercise 16. (Written)

In each of the following, find the total cost of the number of shares purchased at the unit prices indicated. Compute the commission in accordance with the table of rates shown on page 209. The commission is 10% less than the amount so computed if the number of shares is less than 100.

1. 100 Bickford Corporation at $6\frac{3}{4}$.
2. 300 United Metal at $17\frac{1}{2}$.
3. 200 Wentworth Products at $52\frac{1}{2}$.
4. 60 Perfection Oil at $14\frac{1}{2}$; transfer taxes, 5¢ per share.
5. 40 Century Can at $48\frac{1}{4}$; total transfer taxes, $.60.
6. 70 Sunset Mining at $125; transfer taxes, 6¢ per share.
7. 100 Kensington Copper at $49\frac{1}{2}$.
8. 400 Parker Steel at 62.
9. 40 Clark Corporation at $24\frac{5}{8}$; total taxes, $.12.
10. 80 Wearwell Hosiery at $28\frac{3}{8}$; taxes, 6¢ per share.

Dividends. When a corporation decides to distribute profits to the stockholders, it is said to *declare a dividend.* The dividend may be expressed either as a certain per cent of the par value of the stock or as a specified amount of money per share.

For example, if a corporation declares a dividend equivalent to $1\frac{1}{2}$% of the par value, and the par value of the shares is $100, the amount of the dividend on each share is $1\frac{1}{2}$% of $100, or $1.50. The corporation may therefore announce the declaration of either a dividend of $1\frac{1}{2}$% or a dividend of $1.50 per share. In the case of no-par-value stock, the dividend is always expressed as a specified amount per share.

Dividends may be declared quarterly, semiannually, or annually. The dividend payments are usually made by checks, which are mailed to the stockholders.

Classes of Stock. Many corporations issue two classes of stock—common stock and preferred stock.

Common stock is the ordinary stock of a corporation. It does not provide for the payment of any specified rate of dividend to the owners.

Preferred stock is stock that bears a specified rate of dividend, such as 5%, or $5 a share. The corporation does not guarantee that the dividend will be paid. It does promise, however, that dividends at the specified rate will be paid on the preferred stock before any dividends are paid on the common stock. In other words, the preferred stock ranks ahead of the common stock in the distribution of the profits.

To Find the Income from an Investment in Stock When the Number of Shares Owned Is Given. The income from an investment in stock is represented by the amount of the dividend the stockholder receives from the corporation. To find the amount of dividend payment, multiply the dividend paid on one share by the number of shares the stockholder owns.

The yearly income from the investment is the total of all the dividend payments received during the year.

Example 1: Lewis Parker owns 20 shares of Wilcox Corporation stock, par value $100. If the corporation declares a $4\frac{1}{2}$% dividend, what is the total dividend payment Parker should receive?

Solution: $.04\frac{1}{2} \times \$100 = \$4.50$, *dividend on 1 share*
$\$4.50 \times 20 = \$90$, *total dividend*

Example 2: What yearly income will Carl Wegner receive from an investment in 50 shares of Lamson Rayon Company common stock if a dividend of $\$.37\frac{1}{2}$ is paid quarterly?

Solution: $\$.37\frac{1}{2} \times 50 = \$18.75$, *dividend for 1 quarter*
$\$18.75 \times 4 = \$75$, *yearly income*

Exercise 17. (*Written*)

1. P. E. Purcell owns 60 shares of Crown Candy Company stock, par value \$100. If the corporation declares a semiannual dividend of $3\frac{1}{2}\%$, what will be the amount of Purcell's dividend check?

2. What is the amount of Paul Dickinson's annual income from 80 shares of Fairdale Stores stock if the stock pays quarterly dividends of $62\frac{1}{2}$¢ a share?

3. The preferred stock of the Republic Electric Corporation pays a regular semiannual dividend of $2\frac{3}{4}\%$.* If Charles Hooker owns 140 shares of the stock, what annual income does he receive from his holdings?

*When the dividend is expressed as a per cent, but the par value is not given, the par value is assumed to be \$100.

4. R. C. Rockwell owns 150 shares of the common stock of the Reliance Manufacturing Company, paying quarterly dividends of $1\frac{3}{4}\%$. If the par value of the stock is \$50, how much is his annual income from the 150 shares?

5. What was Lester Carson's income for the year from 125 shares of Butler Brothers stock if the stock paid 20¢ a share quarterly and an additional year-end dividend of 15¢ a share?

6. George Wieland owns 70 shares of 5% stock* and 50 shares of 6% stock. What is his annual income from the 120 shares?

*The expression "5% stock" means a stock that pays dividends at the annual rate of 5%.

Exercise 18. (*Written*)

1. The preferred stock of the Brighton Novelty Corporation pays an annual dividend of \$4.50 a share. How many shares of the stock would an investor have to own in order to receive a dividend check amounting to \$1,350?

2. (a) If the common stock of the Emerson Kodak Company pays regular quarterly dividends of 35¢ a share, what would be an investor's annual income from one share of the stock? (b) How many shares of the stock would he have to own in order to receive an annual income of \$1,750 from his investment?

3. (a) If the common stock of the General Radio Corporation pays quarterly dividends of 40¢ per share, how many shares will H. C. Guyer have to buy if he desires to receive an annual income of \$600? (b) What will be the amount of his investment if he buys the stock at 42, plus \$22.50 for taxes and \$113.77 for the broker's commission?

4. How much must be invested in a stock which can be bought at 50, and which pays semiannual dividends of $1.25 a share, in order to receive an annual income of $700, if the broker charges $89.00 for buying and $1.20 for taxes?

5. How much must be invested in 5% preferred stock at 80 to receive annual dividends of $800 if $3.60 is charged for taxes and $61.72 is charged for brokerage?

Problems for Application and Review

Group A

1. (a) $4.95 is ⅗ of what amount? (b) Find the interest at 6% on $629.15 for 29 days. (c) Multiply $12,500 by .0375. (d) Express ⅝% as a decimal. (e) $16.80 increased by 62½% of itself equals what amount? (f) Find the interest on $189.75 for 86 days at 6%.

2. What is the amount of J. M. Carson's annual income from 85 shares of Paramount Oil stock if the stock pays quarterly dividends of 37½ cents a share?

3. What was Frank Lowell's total investment in nine $1,000 bonds that he purchased at 115⅝ plus a brokerage fee of $2.50 per bond?

4. A $1,000 bond, bearing interest at 4%, was purchased for $800. What was the per cent of return on the investment?

5. Earl Martin owns $14,000, par value, of 4¼% bonds that he purchased at 108¾. What is the amount of his annual income from the investment?

6. How many 2¼% bonds, par value $1,000 each, must W. A. Wiley purchase if he desires an annual income of $1,260 from his investment?

Group B

1. (a) $3.60 is ⅚ of what amount? (b) Find the interest on $491.87 for 49 days at 6%. (c) Divide 1,680 by 16,000. (d) What amount decreased by ¼ of itself gives $16.80? (e) $36 is 25% more than what amount? (f) Find the interest at 6% on $215.35 for 87 days.

2. A. B. Sutton owns 50 shares of 4% stock and 80 shares of 5½% stock. What is his annual income from the 130 shares, assuming that dividends on both stocks are paid?

3. An investor bought six $1,000 bonds at 88$\frac{3}{8}$. How much did he invest in the bonds if the brokerage charge was $15?

4. G. A. Haddon purchased ten $1,000, 4$\frac{1}{4}$% bonds at 105 and twelve $500, 3$\frac{3}{4}$% bonds at 90. What rate of return, to the nearest tenth per cent, does he obtain on the total investment?

5. A savings bank pays interest on its deposits at the rate of 2% a year and adds the interest to the balance on the first of January, April, July, and October. After interest was recorded on October 1, 1952, a depositor's balance was $420. On that day he withdrew $120. On April 1, 1953, he deposited $75. (a) What was his balance on July 1, 1953? (b) What was his total interest for the nine months?

6. A grocer mixed 30 pounds of coffee costing 55¢ a pound with 20 pounds costing 65¢ a pound. What was the cost of the mixture per pound?

Group C

1. (a) Multiply $18,000 by 1.125. (b) Find the interest at 6% on $375.50 for 68 days. (c) What amount decreased by $\frac{1}{3}$ of itself equals $33? (d) $35 increased by what per cent of itself gives $112? (e) $8.40 is 25% less than what amount? (f) Find the interest on $375 for 97 days at 6%.

2. How much must be invested in 6% preferred stock at 120 in order to obtain an annual income of $1,650 if $112 is charged for taxes and brokerage?

3. Ernest Moak invested $17,175 in 4% bonds at 114$\frac{1}{4}$ plus a brokerage fee of $2.50 per bond. If the par value of each bond was $1,000, how many bonds did he buy?

4. A 4% mortgage for $4,000, dated January 1, requires the quarterly payment of interest together with a payment of $50 on the principal. What will be the amount of the quarterly payment due at the end of the fifth year, counted from the date of the mortgage?

5. The advertised price of an electric refrigerator is $189.50. When it is bought on the installment plan, a down payment of $22.50 is required. To the remaining unpaid balance a carrying charge of $13.36 is added. The resulting amount is then due in twelve equal monthly payments. What is the amount of each monthly payment?

Section 6 . . . Investments in Stocks (Concluded)

To Find the Rate of Income on an Investment in Stock. Rate of income on an investment, as explained in a preceding section, is found by dividing the annual income by the amount invested, and is expressed by the formula,

$$\text{Rate of Income} = \frac{\text{Annual Income}}{\text{Investment}}$$

In the case of an investment in stock, the annual income is represented by the annual dividends. The amount of the investment is represented by the total cost of the stock, including the market price, brokerage, and transfer taxes. The rate of income is therefore equal to the annual dividends divided by the total cost.

Exercise 19. (Written)

1. Herbert Simons purchased through his broker 50 shares of Seaboard Milling Company stock at 23. The broker charged $14.17 for buying and 6¢ a share for taxes. The stock pays regular quarterly dividends of 37½¢ a share. (a) What is the amount of his investment in the 50 shares? (b) What is the amount of his annual income from the investment? (c) The annual income is what per cent of the investment, calculated to the nearest tenth per cent?

2. Julian Howe purchased through his broker 40 shares of Dana Oil stock at 19. The broker charged $11.34 for buying and 5¢ a share for taxes. The stock pays regular quarterly dividends of 25¢ a share. What is the rate of income on investment, calculated to the nearest tenth per cent?

3. Russell French purchased 60 shares of Erie Railroad stock at 22. The broker charged $14.94 for commission and 6¢ a share for taxes. If the stock pays semiannual dividends of 50¢ a share, what is the rate of income on the investment, calculated to the nearest tenth per cent?

4. Francis Myers purchased 20 shares of Pullman Petroleum at 24, paying $8.82 for commission and $.18 for taxes. If he receives semiannual dividends of 75¢ a share, find the rate of income to the nearest tenth per cent.

Exercise 20. (*Written*)

In problems like the following it is customary to disregard transfer taxes on the assumption that the investment is made in even 100-share lots.

1. What is the rate of income, to the nearest tenth per cent, on a stock that can be bought at 70, plus $33 brokerage per 100 shares, if the stock pays semiannual dividends of $2.25 a share?

2. If a stock that pays quarterly dividends of 30¢ is bought at 19⅛ plus brokerage at $19.56 per 100 shares, what is the rate of return on the investment, calculated to the nearest tenth of 1 per cent?

3. What per cent on the investment will a 6% stock pay if it is bought at 115¾ plus $37.58 brokerage per 100 shares? (Carry the result to the nearest hundredth per cent.)

4. What is the difference between the rates of income on Peerless Corporation stock quoted at 75 and paying quarterly dividends of 62½¢, and Eastern Utilities stock quoted at 85 and paying semiannual dividends of $1.50. (Disregard brokerage. Carry the answer to the nearest tenth per cent.)

To Find the Proceeds of a Sale of Stock. When a person sells stock through a stockbroker, he receives the market price less the cost of the brokerage and taxes. The amount that he receives is called the *net proceeds*. Expressed as a formula:

Market Price − Brokerage − Taxes = Net Proceeds

Exercise 21. (*Written*)

1. What are the proceeds from 80 shares of stock sold at 45½ if $25.38 is paid for brokerage and taxes?

2. What are the proceeds from the sale of 30 shares of Wilcox Oil Company stock at 8½ if the commission charge is $6.79 and the charge for taxes is $.71?

3. Find the proceeds from the sale of 200 shares of Dutton Television stock at 9¾ if the brokerage was $14.75 per 100 shares and the total charge for taxes was $4.14.

4. Charles Hutton placed 60 shares of Edison Corporation stock with his broker to sell for him at 33. The broker sold the shares at that price, charging $6.04 for taxes and $17.91 for selling. What were the net proceeds Mr. Hutton received from his broker?

5. Thomas Jeffrey sold through his broker 40 shares of Hayden Corporation stock at 28. The broker charged $1.87 for taxes and $14.04 for his commission. What net proceeds did Mr. Jeffrey realize from the sale of the stock?

To Find the Profit or Loss on the Sale of Stock. The profit or loss on a sale of stock is the difference between the total cost of the stock and the net proceeds. If the amount of the net proceeds is greater than the total cost, the result is a profit; if it is less than the total cost, the result is a loss. Thus,

Net Proceeds − Total Cost = Profit
Total Cost − Net Proceeds = Loss

Exercise 22. (*Written*)

1. On August 10, Clifford Greene bought 60 shares of stock at 18, paying $13.86 for brokerage and 5¢ a share for taxes. On December 15 he sold the stock at 26, paying $6.04 for taxes and $16.02 for brokerage. (a) What was the total cost of the stock? (b) What were the net proceeds from the sale of the stock? (c) What was his profit or loss on the sale of the stock? (d) During the time he held the stock he received two quarterly dividends of 20¢ a share. How much did he receive in dividends? (e) What was his total gain or total loss on the transaction?

Add the total dividends received and the profit on the sale of the stock to find the total gain on the transaction.

2. On May 15, George Kraft purchased 40 shares of stock at 32, paying $14.76 for the broker's commission and 6¢ per share for taxes. On June 10 and again on September 10 he received a cash dividend of 35¢ a share. On September 25 he sold the stock at 38, paying $4.04 for taxes and $15.84 for the commission. (a) What was his profit or loss on the sale of the stock? (b) How much did he receive in dividends? (c) What was his total gain or total loss on the transaction?

3. On March 8, Lewis Howell purchased 60 shares of stock at $8.50 a share, for which the broker charged $9.09 commission for buying and a tax charge of 15¢. He held the stock until June 20, when he sold it for $12.25 a share, paying a commission of $11.11 and a tax of $1.97. During the time he held the stock he received a dividend of 12½¢ a share. (a) What was his profit or loss on the sale of the stock? (b) What was his total gain or total loss on the transaction?

To Find the Unexpended Balance When Proceeds from the Sale of Stocks or Bonds Are Reinvested. An investor may deposit stocks or bonds with his broker with instructions to sell them and purchase other stocks or bonds, with payment for the latter to be made from the proceeds of the stocks or bonds sold. The unexpended balance is the amount that remains after deducting the total cost of the purchase from the net proceeds of the sale.

Example: Leon True deposited 60 shares of Bixby Oil stock with his broker with instructions to sell the stock at 40 and buy 50 shares of Norfolk Steel stock at 46½. The commission and taxes on the sale amounted to $25.85 and on the purchase, $22.47. What was the unexpended balance?

Solution

Proceeds from sale of Bixby Oil stock:		
Market price of stock, $40 × 60	*$2,400.00*	
Commission and taxes	*25.85*	
Net proceeds		*$2,374.15*
Total cost of Norfolk Steel stock:		
Market price of stock, $46½ × 50	*2,325.00*	
Commission and taxes	*22.47*	
Total cost		*2,347.47*
Unexpended balance		*$ 26.68 Ans.*

Exercise 23. (*Written*)

1. R. I. Case owned 30 shares of Dreer and Company stock that he placed with his broker. He instructed the broker to sell the stock at 41½ and buy 75 shares of Bristol Corporation stock at 16. The brokerage and taxes on the sale amounted to $17.64 and on the purchase, $18.15. (a) What were the proceeds from the sale of the Dreer and Company stock? (b) What was the total cost of the Bristol Corporation stock? (c) What was the unexpended balance?

2. Roy Dixon owned 80 shares of Conover Corporation stock. He authorized his broker to sell the stock at 15¾ and buy 40 shares of Dunlap Company stock at 30. Brokerage and taxes on the sale were $21.10. On the purchase, the brokerage was $14.40, and the taxes were 6¢ per share. How much was the unexpended balance?

3. Harry Pratt inherited $12,000 that he placed with a broker for investment in Gulf Chemical Company $1,000 bonds. (a) If the bonds can be purchased at 89¾ and the brokerage is $2.50 for each bond, what will be the total cost of one bond? (b) How many bonds can the broker buy for him?* (c) What will be the total cost of the bonds? (d) How much money will be returned to Mr. Pratt?

> *Divide the amount available for investment by the total cost of one bond. Drop the fraction in the quotient, because only a whole bond can be purchased.

4. John Fay owned 200 shares of Reliance Steel stock. He authorized his broker to sell the stock at 81¼ and buy $1,000 Detroit Edison bonds at 106½. The broker charged $79.59 for brokerage and taxes for selling the stock, and $2.50 each for buying the bonds. (a) What amount was available for the purchase of the bonds? (b) How many bonds were bought? (c) What was the unexpended balance?

Problems for Application and Review

Group A

1. (a) Divide 3,090 by 15,000. (b) Find the interest on $987.50 for 11 days at 5%. (c) Find the number of days from September 10 to December 5. (d) $2.64 is ⅜ of what amount? (e) $196.50 minus 66⅔% of itself leaves what amount? (f) Find the interest at 7% on $372.15 for 40 days.

2. What per cent on the investment, to the nearest tenth per cent, will a 6% stock pay if it is bought for 104, brokerage at the rate of $36.40 per 100 shares?

3. If Milton Oliver desires an annual income of $900 from the investment, how many $1,000, 3¾% bonds will he have to purchase?

4. Paul Keene bought twenty $1,000, 5½% bonds at 137½ and ten $500, 4% bonds at 125. What rate of income does he receive on his total investment, computed to the nearest tenth per cent?

5. A salesman receives a commission of 5% on his sales. In order to receive $150, what should be the amount of his sales?

Group B

1. (a) $3.30 is what per cent less than $4.95? (b) Find the interest at 4½% on $873.45 for 22 days. (c) Multiply $17,000 by .04125. (d) What amount decreased by ⅕ of itself equals $30? (e) Find the interest on $282.27 for 100 days at 6%.

2. A share of stock costing $200 paid a quarterly dividend of $2.25. To what annual rate of return is this equivalent?

3. Connor purchased 200 shares of preferred stock at $32\frac{1}{2}$ plus a brokerage fee of $26.25 for each hundred shares. After he had received a dividend of $1.50 per share, he sold the stock at $35\frac{3}{4}$. Expenses incurred in the selling of the stock were $55.76 for brokerage and $20.15 for Federal and state taxes. What was Connor's total gain?

4. How much did Gerard Perry invest in fifteen $500 bonds that he purchased at $101\frac{1}{2}$ plus brokerage at $1.25 per bond?

5. A bond having a par value of $1,000 and bearing interest at $3\frac{1}{2}\%$ can be bought at $87\frac{1}{4}$ plus a brokerage fee of $2.50. (a) If you invest $17,500 in the bonds, how many bonds will you own? (b) What will be your annual income from the investment? (c) What rate of return will you receive on your investment?

Group C

1. (a) $7.50 is $66\frac{2}{3}\%$ of what amount? (b) Find the interest on $515.90 for 33 days at 5%. (c) Divide 364 by 13,000. (d) $56.70 increased by $16\frac{2}{3}\%$ of itself equals what amount? (e) Find the interest at 6% on $198.05 for 106 days.

2. On February 1, M. R. King bought 70 shares of stock at $98\frac{1}{2}$, brokerage and taxes $33.81. On April 1 and again on October 1, he received a cash dividend of $2.50 a share on the stock. On November 1 he sold the stock at $110\frac{1}{4}$, brokerage and taxes $37.51. (a) How much did King gain on the sale of this stock? (b) How much did he make on the entire transaction?

3. What is the rate of income on a $5\frac{1}{2}\%$ bond purchased at 110?

When the par value per bond is not given, assume a par value of $1,000 and solve accordingly.

4. A. B. Minton invested $33,000 in $5\frac{1}{2}\%$ bonds at $137\frac{1}{4}$ plus brokerage at $2.50 per bond. (a) How many bonds, $1,000 par value, did he buy? (b) What was his total annual income from the bonds? (c) What rate of income did he receive on his investment?

5. A savings bank pays interest semiannually on deposits at the rate of $2\frac{1}{2}\%$ per annum. Interest is credited to the depositors' accounts on January 1 and July 1. On July 1, 1951, Bert Foster deposited $500. He withdrew $150 on July 1, 1952. How much did Foster have on deposit on January 1, 1953?

Section 7 . . . Investments in Real Estate

Gross Income and Net Income from Real Estate Investments. Many persons invest their surplus funds by purchasing improved real estate, such as residential or business property, which may be rented to others and thus provide a source of income for the owner.

The rent that a property owner receives from a tenant represents his *gross income* from the property. His *net income* is the amount remaining after deducting his ownership expenses from the gross income. The income and expenses are usually figured on an annual basis.

For example, James Glavin purchased for $7,000 a one-family house that he rented last year to a tenant for $60 a month, receiving for the year a gross income of $60 × 12, or $720. His expenses for the year for taxes, insurance, repairs, etc., totaled $430. His net income from the investment was therefore $720 − $430, or $290 for the year.

Expenses. In calculating his net income, the owner should include all the expenses connected with the ownership of the property. These expenses usually consist of cash payments for such items as taxes, insurance, repairs and upkeep, and interest on the mortgage if there is a mortgage on the property.

Besides the cash payments, the owner should include an allowance for the decrease in the value of the property. Even though a house, for example, is kept in good repair, it gradually wears out and becomes less valuable. Furthermore, with the passage of time, changes in style of architecture or changes in the character of the neighborhood may make the property less desirable and thus decrease its value. This decrease in value, resulting from wear and the passage of time, is called *depreciation.* The annual rate of depreciation is not the same for all types of buildings. For residential and business property it may average from 2% to 4% of the value of the building.

To Find the Annual Net Income from an Investment in Real Estate. The annual net income on an investment in real estate, it has been shown, is the amount remaining after deducting the annual expenses from the annual rental income.

Annual Rental Income − Annual Expenses = Annual Net Income

Exercise 24. (Written)

1. Donald Becker purchased a house and lot as an investment for $9,000, paying $3,000 in cash and giving a 5% mortgage for the remainder. The house is valued at $8,100 and the lot at $900. Besides interest on the mortgage, his expenses for the first year were: taxes, $188; insurance, $20; repairs and upkeep, $135; depreciation, 2% of the value of the house. He rented the house for the year at the rate of $85 a month. (a) What was the gross rental income for the year? (b) What was the total of the expenses? (c) What was the net income for the year?

> Observe that the mortgage interest rate is based on the amount of the mortgage, $6,000; and that the depreciation rate is based on the value of the house, $8,100.

2. M. E. Cowan bought a two-family house for $11,000, paying $4,500 in cash and giving a 4½% mortgage for the remainder. The lot was valued at $1,500 and the building at $9,500. During the first year, he received $57.50 a month for the rent of each apartment. In addition to the interest on the mortgage, he paid $239.50 for taxes, $27 for insurance, $175 for repairs and miscellaneous expenses, and allowed 2% of the value of the house for depreciation. What was the amount of his net income for the year?

3. On January 1 of last year, N. J. Ford purchased a house for $6,250 on which he had been receiving 2% interest. He immediately rented the house for the year at the rate of $55 a month. He paid $14 for insurance, $140 for taxes, $95 for minor repairs and miscellaneous expenses, and allowed $115 for depreciation. (a) What was his net income for the year from his investment? (b) By how much did Mr. Ford's investment increase his net income over the preceding year?

4. Douglas Harwood is offered a piece of store property for $15,000, which rents for $145 a month. The average annual cost of taxes and insurance on the property is $442, and he estimates that repairs and depreciation will average $390 a year. (a) If he should purchase the property by paying $5,000 in cash and giving a mortgage at 5% for the balance, what would be his estimated annual net income from the property? (b) How much greater would this income be than if his money were invested in bonds yielding 3.2% on the investment?

To Find the Rate of Income on an Investment in Real Estate. The rate of income is based on the owner's cash investment in the property and is found by dividing the annual net income by the cash investment.

$$\text{Rate of Income} = \frac{\text{Annual Net Income}}{\text{Cash Investment}}$$

Exercise 25. (*Written*)

1. L. M. Sisson purchased a house and lot, as an investment, for $12,000, paying $4,000 in cash and giving a $4\frac{1}{2}\%$ mortgage for the balance. The house rents for $110 a month. Besides interest on the mortgage, other annual expenses amount to $640. (a) Find Mr. Sisson's annual net income from the investment. (b) His annual net income is what per cent of his cash investment?

2. C. C. Lamson purchased a house and lot for $7,200, paying $2,000 in cash and giving a 5% mortgage for the remainder. In addition to interest on the mortgage, expenses for the first year for taxes, depreciation, insurance, repairs, and miscellaneous items amounted to $370. He rented the house for $62.50 a month. (a) What was his net income for the year? (b) What was the rate of income on his investment?

3. G. D. Stoddard purchased a two-family house for $13,500, the house being valued at $11,900 and the land at $1,600. He rents each apartment for $65 a month. He pays $350 annually for taxes and insurance and allows 3% of the value of the house for depreciation and repairs. (a) What is his annual net income from the property? (b) What rate of income, to the nearest tenth per cent, does he realize on the investment?

4. A man is offered a piece of store property for $21,000, which rents for $200 a month. The average annual cost of taxes and insurance is $545, and the man estimates depreciation and repairs at $630 a year. What rate of income, to the nearest tenth per cent, would he realize if he invests in this property, paying the full purchase price in cash?

To Find the Rent That Must Be Charged to Yield a Given Rate of Income. If the owner desires a stated rate of return on his investment, the annual rental income must be sufficient to cover all annual expenses plus the amount of the net income desired.

$$\text{Annual Rental Income} = \text{Annual Expenses} + \text{Annual Net Income}$$

The monthly rent that should be charged is found by dividing the required annual rental income by 12.

Exercise 26. (*Written*)

1. R. E. Beach buys a house as an investment for $24,000, paying the full purchase price in cash. The estimated annual expenses total $1,260. (a) If he desires to realize a net income of 6% on his investment, what should be the amount of his annual net income? (b) What should be his gross income, or annual rental income? (c) What monthly rent should he charge the tenant?

2. What monthly rental must be charged for a house costing $10,000 in order to realize a net income of 5½% on the investment if the annual expenses are $320 for taxes, $110 for repairs, $30 for insurance, and $250 for depreciation?

3. A man purchased a two-family house for $14,000, paying $5,000 in cash and giving a mortgage at 4½% for the balance. Annual expenses, in addition to interest on the mortgage, are: taxes, $369; insurance, $25; general repairs and upkeep, $125; depreciation, $250. What monthly rent must he charge each family in order to cover all expenses and obtain 7% on his investment?

The expression "7% on his investment" means 7% on his *cash* investment.

4. A four-family house is purchased for $22,000, subject to a $15,000 mortgage at 5%. The annual expenses, in addition to interest on the mortgage, include $735 for taxes, $55 for insurance, $325 for repairs, and $600 for depreciation. What monthly rental, to the nearest dollar, must be charged each family in order that a net income of 6% may be realized on the investment?

To Find the Investment, Given the Annual Net Income and the Rate of Income. When the annual net income and the rate of income are known, the amount of the owner's cash investment in the property can be found by dividing the annual net income by the rate of income.

$$\textbf{Cash Investment} = \frac{\textbf{Annual Net Income}}{\textbf{Rate of Income}}$$

Exercise 27. (*Written*)

1. The owner's annual net income from an apartment house is $1,995, which is 5% of his investment in the property. What is the amount of his investment?

2. D. L. Cook owns a two-family house that yields 8% on his investment. What is the amount of his investment in the property if the annual net income is $940?

3. E. L. Whiting is considering the purchase of a four-family house as an investment. The total annual rental income from the property is $2,640. The annual expenses for taxes, insurance, repairs, depreciation, etc., total $1,350. (a) What is the annual net income from the property? (b) What is the largest amount of cash he can afford to invest in the house if he desires to realize 6% net income on his investment?

4. Fred Allen is considering the purchase of a house which rents for $70 a month and which may be bought by giving 5% mortgage for $5,000 and cash for the balance. Besides interest on the mortgage, other expenses average $380 annually. (a) What is the largest amount of cash he can afford to invest in the house if he desires 7% net income on his investment? (b) What is the highest price he can afford to offer for the house?

The highest price he can offer is the sum of the cash investment and the amount of the mortgage.

Capital Outlay. A property owner should distinguish carefully between his capital outlay and his expenses. His capital outlay consists of his original investment plus any subsequent expenditures for additions and improvements that make the property more valuable than it was when he acquired it. Such expenditures should be added to his original investment to give his total investment in the property.

On the other hand, expenditures for repairs and replacements, which do not increase the value of the property but merely maintain the property in the same condition as when it was acquired, should be treated as expenses and deducted from his gross income from the property.

Exercise 28. (*Written*)

1. Arthur Staples buys a house for $5,000. He spends $1,600 for permanent additions and improvements and then rents the house to a tenant for $68 a month. Taxes and insurance cost $165 a year, and he allows $265 a year for upkeep and depreciation. (a) What is his total investment in the property? (b) What is his annual net income? (c) What is the rate of income on the investment, calculated to the nearest tenth per cent?

2. H. B. Ross is considering the purchase of a house and lot that he can buy for $4,500. He estimates it will cost an additional $2,500 for reconditioning and modernization. The total annual expense for taxes, insurance, depreciation, and upkeep is estimated at $450. What monthly rent would he have to charge, after reconditioning and modernizing the house, in order to realize 6% on his investment?

3. O. C. Osgood is considering the purchase of a house that is being offered for sale at $6,700. He estimates it will cost an additional $1,000 for certain improvements and additions, after which the house can be rented for $73 a month. He also estimates that the annual expenses for taxes, insurance, depreciation, etc., after completing the improvements and additions, will amount to $480. What is the highest price he can afford to offer for the property in its present condition if he wishes to net $5\frac{1}{2}$% on his investment?

4. A house that is out of date and in run-down condition is offered for sale at $6,600, subject to a $4,000 mortgage at 5%. It is estimated that $3,000 will have to be spent for repairs, improvements, and alterations, after which the house can be rented for $85 a month. Besides interest on the mortgage, the annual expense on the reconditioned property for taxes, insurance, depreciation, etc., is estimated at $470. What is the highest price an investor can afford to offer for the property in its present condition, subject to the $4,000 mortgage, if he desires a net return of 7% on his investment?

Problems for Application and Review

Group A

1. (a) 144 is $\frac{3}{8}$ of what number? (b) Express $\frac{7}{8}$% as a decimal. (c) 90 is what per cent of 36? (d) What amount increased by 45% of itself gives $23.78? (e) Find the interest at 4% on $815.25 for 22 days.

2. Vinson bought a house for $13,400, giving $2,400 cash and a 5% mortgage for the balance. In addition to the interest on the mortgage, his annual expenses were: taxes, $270; insurance, $60; repairs, $200; and depreciation at 2% of the cost of the house. He rented the house for $130 a month. What was Vinson's net rate of return on his cash investment, to the nearest tenth per cent?

3. E. J. Walker invested $5,265 in $500, $2\frac{3}{4}$% bonds at $87\frac{1}{2}$ plus a $1.25 brokerage fee per bond. How many bonds did he buy?

4. Morton owned 40 shares of stock that cost him $3,200, including brokerage fee and taxes. On each share he received quarterly dividends of $1.40. What annual rate of return did he receive on his investment?

5. A. L. Murray placed $14,500 with his broker for investment. (a) How many Dalton Electric $1,000 bonds can the broker purchase for him at 87½ if $2.50 per bond is charged for brokerage and taxes? (b) What will be the unexpended balance?

Group B

1. (a) Multiply $16,000 by .25364. (b) $16 is ⅜ smaller than what amount? (c) What per cent of $45 is $54? (d) $24.75 is what per cent greater than $22.50? (e) Find the interest on $792.35 for 23 days at 6%.

2. Harper bought a house and lot for $8,500, paying $3,500 in cash and giving a 5% mortgage for the remainder. He rented the house for $90 a month. If taxes amounted to $273 and the yearly upkeep was estimated at 4% of the cost of the property, what rate of income did he receive on his actual investment?

3. L. A. Brown purchased a dwelling house for $9,650. For how much a month must the house be rented to yield 6% on the original cost and to provide also for the following annual expenses: depreciation, 2%; taxes, $146.50; insurance, $36.50; repairs, $125?

4. What is the rate of return on a 3% bond bought at 93¾?

5. What yearly income does Wayne Haller receive from an investment of $15,750 in Pennsylvania Railroad 5%, $1,000 bonds purchased at 104¾, plus brokerage at $2.50 per bond?

Cumulative Review

1. For the first 11 months of the year a salesman's average sales are $4,050 a month. What must be the amount of his sales for the next month in order that his average monthly sales for the 12 months may be $4,125?

2. The Stewart Electric Company pays its employees time and a half for overtime. Regular factory hours are 8 hours a day, Monday through Friday. All other working time each day is considered to be overtime. During the week of October 20, Leon Miner worked as follows: Monday, 7 hours; Tuesday, 8½ hours; Wednesday, 9 hours; Thursday, 10½ hours; Friday, 6 hours; Saturday, 5 hours. If his regular wage rate was $1.55 an hour, what was the amount of his wages for the week?

3. An appliance company pays each of its two salesmen a monthly salary of $250 plus 5% commission on all sales in excess of

$5,000 in a single month. Their sales records for three months were as follows:

	MAY	JUNE	JULY
R. F. Wilkins	$8,480	$7,704	$5,760
J. L. Sims	7,800	8,720	6,950

(a) Find each salesman's total income for the three months. (b) Which salesman earned the greater commission? (c) How much greater?

4. An antique table purchased several years ago for $12.50 is now worth $50. What is the per cent increase in the value of the table?

5. A man paid $520 in full settlement of the principal and interest on a loan of $500 for 8 months. What rate of interest did he pay?

6. An 80-day note for $348, bearing 5% interest, is dated March 10. Find (a) the date of maturity of the note and (b) the total amount due at maturity.

7. A price tag on a used car reads: cash price $900; installment plan, $300 down payment with 12 monthly payments of $53 each. (a) By what per cent does the installment price exceed the cash price? (b) A prospective buyer has $300 cash. Should he buy the car in accordance with the installment plan or borrow the additional money for one year at 5% and pay cash? (c) What amount will he save?

8. J. J. Sessler owns $5,000, par value, of 5% bonds, which he purchased at 115, and $8,000, par value, of 4½% bonds, which he purchased at 95. What is the rate of return on the total investment, computed to the nearest tenth per cent?

9. A. S. Prior bought 60 shares of $100 par value, 4% preferred stock at $75 per share. He received dividends for one year, then sold the stock at $83 per share. The brokerage was $27.45 on the purchase and $27.88 on the sale. Taxes on the purchase amounted to $3.60 and on the sale, $6.10. (a) What was his profit on the sale of the stock? (b) How much did he receive in dividends? (c) What was his total gain on the transaction?

10. C. F. Price placed $12,500 with his broker for investment. (a) How many Colorado Pacific $500 bonds can the broker buy for him at 102¾ if the brokerage fee is $1.25 per bond? (b) How much will be left to Price's credit?

UNIT VII

EXPENDITURES FOR THE HOME

Section 1 . . . Home Ownership

Expense of Home Ownership. Before purchasing a home, the head of a family should compare the expense of home ownership with the expense of renting or leasing. The annual expense of home ownership consists of taxes, insurance, repairs, and depreciation. If there is a mortgage on the property, the interest on the mortgage is also an expense of home ownership. It should also include interest on the homeowner's cash investment in the property since he sacrifices the income he might have received had he invested his money in some other way.

Exercise 1. (*Written*)

1. Henry Everett is paying $90 a month rent for a one-family house that he can purchase for $10,000 cash. He estimates the annual expense for taxes, insurance, repairs, and depreciation will amount to $740. In order to make the cash payment for the house, he will have to withdraw the amount from a savings account that pays $2\frac{1}{2}\%$ interest annually. (a) What will be the total annual expense of owning the house? (b) What will be the average monthly expense? (c) What will be the monthly saving as compared with renting?

In the total annual expense, include the interest lost on the amount withdrawn from the savings bank.

2. Robert Powers is paying $78 a month rent for a one-family house. He can purchase the property for $8,500 by paying $3,000 cash and giving a mortgage at 5% for the remainder. He estimates that taxes will amount to $234, repairs $100, insurance $24, and depreciation $150, annually. (a) If he can earn $2\frac{1}{2}\%$ on his money by investing it in Government bonds, would it be cheaper to buy the house or to continue to rent it? (b) How much cheaper per month?

3. E. A. Knapp can rent a certain one-family house for $1,020 a year. He can purchase the property for $12,500 by paying $4,000 cash and giving a $4\frac{1}{2}\%$ mortgage for the remainder. He estimates the taxes will be $400, insurance $22, depreciation $225, and repairs and other expenses $145 per year. (a) Allowing 3% interest on his cash investment, would it be cheaper to rent the house or to buy it? (b) How much would be saved annually?

4. J. J. Gleason, proprietor of a retail clothing business, considers purchasing for $22,500, cash, the building in which his store is located. It is estimated that the annual expenses for taxes, insurance, repairs, depreciation, and other expenses will be $1,158. He considers that his money is worth 6% to him in his business. (a) Which would be cheaper, to buy the building or to continue to rent the store at $230 a month? (b) How much would be saved each month?

5. Douglas Weldon pays $80 a month rent for a house that he can buy for $8,400, cash. How much would he save in a year by buying the house if the taxes, insurance, repairs, and miscellaneous expenses amount to $420 a year, the depreciation is $150 a year, and money is worth 3%?

Building a Home. In some cases a person may desire to have a house constructed according to his own plans instead of buying one already built. This will require both the purchase of land on which to build and the construction of the house. The total cost will ordinarily include the cost of the land, all construction costs, and the cost of landscaping. It will also include the cost of the architect's fee and the builder's services if there are any expenditures for these items.

Arrangements may be made with a building contractor to construct the house either for a stipulated contract price or on what is known as the *"cost-plus" basis*. Under the latter plan, upon the completion of the work, the builder submits a bill for the total amount he has spent for labor and materials, plus a percentage of the total for his services.

Exercise 2. (Written)

1. Arthur Gray contracted with the Sewell Building Company for the erection of a house according to his plans and specifications on the basis of cost plus 10%. On completion of the work, the building company showed its costs were $27,235.80. What amount did Mr. Gray have to pay the building company?

2. Edward Balletin, desiring to build his own home, bought a lot costing $2,500. He paid an architect $350 for drawing plans for the house. A building contractor agreed to build the house on the basis of cost plus 10%. The contractor's costs of labor and materials totaled $27,450. Mr. Balletin also paid a landscape gardener $600 for landscaping the grounds. (a) What was the amount of the builder's fee? (b) What was the total cost of the house? (c) What was the total cost of the land? (d) What was the total cost of the house and land?

The total cost of the house consists of the cost of the labor and materials, the builder's fee, and the architect's fee. The total cost of the land consists of the cost of the lot and the landscaping.

3. Walter George, a house builder, agreed to build a house for Jacob Allen on a cost-plus-12% basis. The estimated costs for material and labor were as follows: excavating, $450; masonry, $1,975; carpentry and lumber, $9,250; plastering and painting, $4,525; roofing, $1,750; plumbing and heating, $5,250; electrical fixtures and wiring, $1,670; other work, $930. (a) What was the estimated total cost of labor and materials? (b) What was the estimated total cost of the house to Mr. Allen?

4. D. A. Mead bought a building lot at a total cost of $2,550. He engaged a building contractor to build a house on the lot on the basis of cost plus 10%. On completion of the work, the contractor presented an itemized statement of costs totaling $21,696. In addition, Mr. Mead engaged the services of Karl Frank, a landscape gardener, and paid him $450 for landscaping. (a) How much did Mead have to pay the building contractor? (b) What was the total cost of the house and lot to Mead?

Problems for Application and Review

Group A

1. (a) Divide 63 by 14,000. (b) Find the interest at $4\frac{1}{2}\%$ on $694.45 for 25 days. (c) What number increased by $\frac{1}{8}$ of itself gives 216? (d) Find the interest at 6% on $613.49 for 41 days.

2. A man pays $75 a month rent for a house that he can buy for $8,400. How much would he save in a year by buying the house if the taxes, repairs, and depreciation amount to $390 a year, the insurance is $24 a year, and money is worth 4%?

3. Walter Gaylord owns 40 shares of Robinson Electric stock that he purchased at 18, plus $10.98 for commission and $.40 for taxes. If the stock is paying quarterly dividends of 35¢ a share, what rate of income, to the nearest tenth per cent, is Gaylord receiving on his investment?

4. What monthly rent must be charged for a house costing $8,500 to realize a net income of 6% on the original investment if taxes are $177, repairs and depreciation, $220, and insurance, $17?

5. Mr. Bernard bought an apartment house for $30,000, paying $10,500 in cash and giving a 5% mortgage for the remainder. He rented it for $450 a month. Besides interest on the mortgage, his expenses for the year were as follows: taxes, $1,140; fuel oil, $750; electricity, $180; insurance, $150; miscellaneous, $180; depreciation, $1,290. What rate of income did he receive on his actual investment?

Group B

1. (a) What number increased by $\frac{3}{8}$ of itself equals 528? (b) Find the interest on $401.27 for 31 days at 6%. (c) What per cent of $75 is $120? (d) $8.88 is 25% less than what amount? (e) Find the interest at 5½% on $613.49 for 55 days.

2. A real estate agent sold a house and, after deducting 4% commission, remitted $7,800 to the former owner. What was the selling price of the house?

3. (a) What yearly income does Roy Hutton receive from an investment of $27,000 in 4½% bonds purchased at 90 (brokerage included)? (b) What rate of return does he obtain on the investment?

When the par value per bond is not given, assume a par value of $1,000 and solve accordingly.

4. The total annual rental of a piece of business property is $6,780. The annual expenses are $3,360. What amount must you pay for this property in order to have your investment net you 6%?

5. A man considers purchasing for $24,500 the building in which his store is located. It is estimated that the annual expenses will be as follows: taxes, $568; insurance, $105; repairs and depreciation, $500. His money is worth 6% to him in his business. (a) Which would be cheaper, to buy the building or to continue to rent the store at $250 a month? (b) How much would he save annually?

Section 2 . . . Real Estate Taxes

Assessed Valuation of Real Estate. One of the major expenses of owning real estate is the property tax levied and collected by the governmental tax district in which the property is located.

The amount of tax a person is required to pay is based upon the value of the property he owns. The value of the property is determined by tax assessors, whose duty it is to examine the property and place a value on it for taxation purposes. This value is called the *assessed valuation.*

The assessed valuation is often lower than the actual market value of the property. In many districts it may be as little as 50% of the market value.

The Tax Rate. The amount of tax a property owner must pay depends upon the assessed valuation of his property and the tax rate.

The method of expressing the tax rate varies in different communities. In some communities, the rate is expressed as a certain number of *dollars* for each $100 or $1,000 unit of assessed valuation; as, for example, $2.85 per $100 or $28.50 per $1,000.

In others, the rate may be expressed as a certain number of *mills* or *cents* for each $1 unit of assessed valuation, such as 28.5 mills per $1 or 2.85 cents per $1.

In still others, the rate may be expressed as a *per cent,* such as 2.85%, of the assessed valuation.

To Find the Amount of a Property Owner's Tax When the Tax Rate Is Expressed in Dollars per $100 or per $1,000 of Assessed Valuation. Each property owner receives a tax bill once or twice a year from his local tax collector. The bill shows the assessed valuation of his property, the tax rate, and the amount of the tax.

The owner may check the amount of the bill by applying the tax rate to the assessed valuation. For example, Arthur Hill's tax bill shows that he owns property assessed at $3,500 and that the tax rate is $2.462 on each $100 of assessed valuation. The amount of Hill's tax is computed as follows:

$3,500 ÷ $100 = 35, number of $100 units in $3,500
$2.462 × 35 = $86.17, amount of tax

Exercise 3. (*Written*)

1. The tax rate in Auburn for the current year is \$4.958 per \$100. What should be the amount of H. S. Patten's tax bill if he owns property assessed at \$6,800?

2. What tax must Alfred Mallon pay on his home, which is assessed at \$7,600, if the tax rate is \$25.47 per \$1,000?

Divide \$7,600 by \$1,000 to find the number of thousands in 7,600. Then multiply \$25.47 by that result.

3. Richard Blackburn owned a house and lot with an assessed valuation of \$8,500 and two vacant lots assessed at \$650 each. The tax rate in his community last year was \$4.025 per \$100. What was the total amount of the tax that Blackburn paid last year on this property?

4. The tax rate in the village of Waverly is \$3.8365 per \$100. If real estate worth \$7,500 is assessed for 80% of its value, find the amount of the tax bill.

5. The tax rate for the support of the schools in a certain school district is \$26.838 per \$1,000 of assessed valuation. Find the amount of Fred Judd's school tax if his property is valued at \$8,250 and is assessed at 80% of its value.

6. The tax rate in a certain village is \$5.4645 per \$100 of assessed valuation. Arthur Hasler owns two pieces of real estate in this village, valued at \$9,600 and \$6,000, respectively, and assessed at 75% of their value. Find the total tax that he must pay.

To Find the Amount of a Property Owner's Tax When the Rate Is Expressed in Mills or Cents per \$1 or as a Rate Per Cent. To find the amount of a property owner's tax when the rate is expressed in terms of mills or cents per \$1, change the mills or cents to an equivalent number of dollars, and multiply that result by the number of dollars of assessed valuation.

Since there are 10 mills in one cent and 100 cents in one dollar, there are 1,000 mills in one dollar. Hence, to change mills to dollars, divide the number of mills by 1,000 and prefix a dollar sign to the result. Thus,

21.3 mills = \$.0213 (21.3 ÷ 1,000)

Similarly, since there are 100 cents in one dollar, to change cents to dollars, divide the number of cents by 100 and prefix a dollar sign. For example:

3.28 cents = \$.0328 (3.28 ÷ 100)

Example: The tax rate in Edgewater is 24.5 mills per dollar of assessed valuation. Find the tax to be paid on property assessed at $4,000.

Solution	*Explanation*
24.5 mills = $.0245 *$.0245 × 4,000 = $98.00* *Ans. $98.00*	The number of dollars equivalent to 24.5 mills is 24.5 ÷ 1,000, or $.0245. The rate, 24.5 mills per $1, is therefore equivalent to $.0245 per $1.

Since the tax is $.0245 on each dollar of assessed valuation, the tax on $4,000 is $.0245 × 4,000, or $98.00.

When the tax rate is expressed as a per cent, multiply the assessed valuation by the decimal equivalent of the rate to find the amount of the tax. For example, if the rate is 2.8%, the tax on property assessed at $5,000 would be $140, computed as follows:

2.8% = .028
.028 × $5,000 = $140

Exercise 4. (Written)

1. Find the amount of the tax to be paid in each of the following:

	ASSESSED VALUATION	TAX RATE		ASSESSED VALUATION	TAX RATE
a.	$9,700	2.05 mills per $1	*d.*	$8,800	2.45¢ per $1
b.	$8,150	5.182 cents per $1	*e.*	$14,750	1$\frac{4}{5}$%
c.	$13,300	2.35%	*f.*	$11,200	9.31 mills per $1

2. The tax rate in Erving is 43 mills per dollar of assessed valuation. Find the tax to be paid on property assessed at $16,350.

3. What tax must Herbert Farr pay on his home, which is assessed at $9,450, if the tax rate is 47.5 mills per $1?

4. Walter Denny owns real estate valued at $13,250, which is assessed at $\frac{4}{5}$ of its value. If the tax rate is 18.9 mills per $1, what is the amount of Mr. Denny's tax bill?

5. The tax rate in School District No. 10 is 32.5 mills per dollar of assessed valuation. What total tax must F. T. Freeman pay if he owns two pieces of property valued at $22,400 and $8,750, respectively, which are assessed at 70% of their value?

Payment of Taxes. Each property owner in a tax district pays his taxes to the district tax collector. In some districts the collector receives a commission on the amount he collects instead of receiving a regular salary. The commission rate varies in different communities, ranging from ½% to 3% or more. The commission is paid by the taxpayer and is charged as an additional item on his tax bill.

As a rule the amount due on a tax bill must be paid on or before a specified date, generally within one to three months after the date of the bill. In most districts a penalty for interest and other charges is imposed for failure to make payment by the date specified. To encourage prompt payment, some districts allow a discount on the amount of the tax if it is paid in advance of a stated date.

Exercise 5. (*Written*)

1. The tax rate in West Oxford is $3.096 per $100, and the tax collector receives 1% commission for collecting the taxes. (a) What is the amount of the tax on George Rider's home, which is assessed at $7,250. (b) What is the amount of the collector's fee? (c) What total amount must Mr. Rider pay?

2. H. C. Ordway's property is assessed at $11,600. What is the total amount he must pay if the tax rate is 28.5 mills per $1 and the collector's fee is 1½%.

3. The tax rate in Mapleton is $31.285 per $1,000. What total amount must John Cross pay if he owns property worth $7,600 assessed at 75% of its value and the tax collector receives 2% commission for collecting the tax?

4. The tax rate last year in Westwood was 37.2 mills per $1. The city tax regulations provide that any bill not paid by April 1 is subject to an added penalty of 1% for each month thereafter. (a) If Paul Booth owned property assessed for $12,500 and paid the tax bill on April 14, what was the amount of his payment? (Any fraction of a month is usually considered as a whole month.) (b) How much was paid by Lynn Morgan, who owned property assessed for $9,000, if he paid the tax bill on June 10?

5. Last year the tax rate in Freeport was $4.879 per $100. The tax regulations provide that a discount of 1% is to be allowed on all tax bills paid between January 1 and January 20 and ½% discount on tax bills paid between January 20 and March 1. (a) If D. A. Lozier owned property assessed at $8,200 and paid the tax bill on January 15, what was the amount of his payment? (b) Leslie Kimbal owned property assessed at $10,000. If he paid his tax bill on February 28, what was the amount of his payment?

Problems for Application and Review

1. (a) $54 is $\frac{4}{9}$ of what amount? (b) What amount is $66\frac{2}{3}\%$ greater than $52.50? (c) What per cent less than 56 is 21? (d) Find the interest at $7\frac{1}{2}\%$ on $410.75 for 25 days. (e) Find the number of days from March 25 to June 8.

2. Mr. Mason owned a house and lot assessed at $7,450. He also owned a farm that was assessed at $16,200. The tax rate on the house and lot was $44.635 per $1,000 and on the farm, $28.247 per $1,000. What was the total amount of Mason's tax?

3. Gerald Morse held a $5\frac{1}{2}\%$ mortgage for $4,000 on the property of Truman, Inc. The mortgage was dated July 1, 1952, and interest was payable semiannually. A notation of the following payments appeared on the bond that was attached to the mortgage:

January 1, 1953; interest due and $1,300 on the principal
July 1, 1953; interest due
January 1, 1954; interest due and $1,600 on the principal

(a) If no additional payments were made, what amount was required to pay the mortgage in full on July 1, 1954? (b) What was the total amount of interest paid for the use of the money?

4. Virginia Lee owned 40 shares of Empire Air Lines stock. She authorized her broker to sell the stock at 61 and buy 50 shares of Calumet Copper at 47. The brokerage in each case was $10 plus $\frac{1}{2}\%$ of the market value of the shares, less 10% of that sum. The taxes on the sale amounted to $1.89 and on the purchase, $3.00. (a) What were the net proceeds from the sale of the Empire Air Lines stock? (b) What was the total cost of the Calumet Copper stock? (c) What amount was unexpended?

5. Rowley offers his house for sale to Brown. Rowley shows that he has been receiving $90 a month rent and that his yearly expenses have amounted to $210 for taxes, $24 for insurance, and $330 for repairs and depreciation. Assuming that the rent and expenses will remain the same, find how much Brown can pay for the house so that he may earn 6% on his investment.

Purpose of Property Insurance. The purpose of property insurance is to protect the owner against loss resulting primarily from damage or destruction of the property by fire. Protection against such loss can be obtained from a fire insurance company at a nominal cost.

Harold M. Lambert

Fire Insurance Protects the Homeowner

For a small additional charge, protection can also be obtained against loss from other causes, such as windstorm, hail, explosion, and smoke.

Terms Used in Insurance. The company from which the insurance is purchased is referred to as the *insurer*. The person who is protected against loss is known as the *insured*. The contract between the insurance company and the insured is called the *policy*. The amount of insurance for which the policy is written is referred to as the *face* of the policy. The sum that is paid to the insurance company for the protection covered by the policy is called the *premium.*

Premium Rates. Premium rates are usually based on $100 units of insurance or coverage as it is sometimes called. For example, the annual fire insurance rate on a certain house might be quoted by the insurance company as $.22 per $100.

The basic rates are annual rates, or rates for one year. Lower rates are charged for policies written for more than one year, the rate for each additional year usually being 75% of the annual rate. The rates for the longer terms work out as follows:

TERM	TERM RATE
2 years	1¾ times the annual rate
3 years	2½ times the annual rate
4 years	3¼ times the annual rate
5 years	4 times the annual rate

Thus, according to the foregoing table, if the annual rate is $.24 per $100, the rate for a three-year policy, for example, would be 2½ times $.24, or $.60 per $100.

Exercise 6. (*Written*)

1. Roger Wilcox insures his house for one year with the Fidelity Fire Insurance Company for $9,200. What is the amount of the premium if the annual rate is $.26 per $100?

2. F. J. Murray insures the furniture in his home for one year with the Globe Indemnity Company for $3,500. If the annual rate is 28¢ per $100, what is the amount of the premium?

3. A house valued at $10,000 is insured annually for $7,500 at the rate of 36 cents per $100. Find the amount of the annual premium.

4. If a house valued at $12,000 is insured annually for 80% of its value at $.26 per $100, what is the amount of the annual premium?

5. E. W. Rankin owns a furnished apartment house. The building is valued at $45,000 and the contents at $14,000. He insures the building annually for 80% of its value at 32¢ per $100 and the contents annually for their full value at 38¢ per $100. (a) Find the premium paid annually for the insurance on the building. (b) Find the premium paid annually for the insurance on the contents. (c) Find the total annual cost of carrying both policies.

Exercise 7. (*Written*)

1. Thomas Allen insured his house for $13,500 at an annual rate of 18 cents per $100. The insurance agent told him it would be to his advantage to insure for a three-year period. The agent explained that if he took out a policy for three years, the rate would be 2½ times the annual rate. (a) What premium did Mr. Allen pay for his one-year policy? (b) What premium would he have paid if he had taken out a three-year policy? (c) What would have been the average annual cost of a three-year policy? (d) How much would Mr. Allen save annually by taking out a three-year policy instead of a one-year policy every year?

2. John Benson owns a house valued at $9,500, which he wishes to insure for 90% of its value. The insurance agent quotes a rate of $.20 per $100 for a one-year policy or 2½ times the yearly rate for a three-year policy. (a) How much premium would Mr. Benson pay for a one-year policy? (b) What would be the average annual cost of a three-year policy? (c) How much would Mr. Benson save annually by taking out a three-year policy instead of a one-year policy every year?

3. A residence valued at $15,000 was insured on a five-year basis for 75% of its value. The quoted rate was 14¢ per $100 for a one-year policy or 4 times the yearly rate for a five-year policy. (a) How much was saved annually by taking out a five-year policy instead of a one-year policy every year? (b) If the insurance was carried on a five-year basis for 15 years, with no change in the premium rate or the face of the policy, what was the total amount of premium paid?

Exercise 8. (*Written*)

1. Edgar Carroll's house is valued at $11,500. He insured it for 80% of its value under a three-year policy carrying a premium rate of 65 cents per $100. (a) What premium did Mr. Carroll pay for the policy? (b) What was the average annual cost of the policy?

2. A residence valued at $7,500 was insured for 90% of its value for five years at the five-year rate of $.88 per $100. (a) What was the amount of the premium? (b) What was the average annual cost of the insurance?

3. What is the average annual cost of insurance on a building valued at $24,000, which is insured under a three-year policy for 70% of its value, if the premium rate on a three-year basis is 55¢ per $100?

4. Sidney Gordon's house is valued at $14,000 and the contents at $4,000. He insures the house for 80% of its value under a five-year policy at 72 cents per $100 and the contents at their full value under a three-year policy at 45 cents per $100. (a) Find the premium paid for the insurance on the house. (b) Find the premium paid for the insurance on the contents. (c) Find the total *annual* cost of carrying both policies.

5. Emily Smith owns a furnished apartment house. The building is valued at $65,000 and the contents at $15,000. She insures the building every three years for 80% of its value at $1.10 per $100 for a three-year policy, and the contents for their full value annually at the rate of $.50 per $100. Find the total *annual* cost of carrying both policies.

Settlement of Fire Loss under an Ordinary Policy. In the event of fire damage, the insurance company must be immediately notified. The company then sends an adjuster to examine the property and decide upon the amount of the loss. Under an ordinary policy, the company will pay the full amount of the loss up to the face of the policy. The company is not liable, however, for any loss in excess of the amount for which the property is insured.

> Thus, if a house is insured for $5,000 and the fire loss amounts to $1,200, the company will pay the full amount of the loss, $1,200. On the other hand, if the loss were $5,800, the company would not pay the full amount of the loss, but would pay only $5,000, the amount for which the house is insured.

Coinsurance. Most fires result in only small partial losses. Seldom does a fire cause total destruction of the property. For this reason there is a tendency on the part of property owners to take out only enough insurance to cover the probable partial losses. Thus, a person owning a building valued at $30,000 might estimate that there is little possibility of fire causing more than fifty per cent loss, and might therefore insure the property for only $15,000. This works to the disadvantage of the insurance company since it collects a premium on only half of the value of the property.

To induce property owners to carry adequate coverage, insurance companies offer reduced rates on policies containing what is known as a *coinsurance clause.* Under this clause, the company is liable for the full amount of any loss or damage up to the face of the policy, provided the property is insured for an amount not less than a specified per cent of its value. The per cent specified may be 60%, 70%, 80%, or 90%, although it is generally 80%. If the clause specifies 80%, for example, it is said to be an *80% coinsurance clause.*

Settlement of a Fire Loss under a Coinsurance Clause. If, under a coinsurance clause, property is insured for an amount equal to or greater than the specified percentage of its value, the insurance company is liable for the full amount of any loss up to the face of the policy.

For example, if a house valued at $10,000 is insured under an 80% coinsurance clause for $8,000, which is exactly 80% of the value, the insurance company will be liable for the full amount of any loss up to the face of the policy, $8,000. If the house is insured for $9,000, which is greater than the 80% minimum, the company will be liable for the full amount of any loss up to $9,000.

On the other hand, if the face of the policy is less than the minimum amount indicated by the coinsurance clause, the company is liable for no greater proportion of any loss than the ratio of the face of the policy to the minimum amount.

Thus, if the house referred to above is insured for only $7,000, which is less than the $8,000 minimum, the company will be liable for only $\frac{7}{8}$ of any loss that occurs, since $7,000 is $\frac{7}{8}$ of $8,000. Hence, in the event of a fire causing $4,000 loss, the company will pay only $\frac{7}{8}$ of $4,000, or $3,500. Expressed as a formula,

$$\begin{array}{c}\textbf{Amount paid by}\\ \textbf{the company}\end{array} = \frac{\textbf{Face of policy}}{\begin{array}{c}\textbf{80\% of value of}\\ \textbf{the property}\end{array}} \times \textbf{Amount of loss}$$

In no case, however, will the company pay an amount greater than the amount of the loss or the face of the policy.

The coinsurance type of policy is widely used in insuring business property. It is also used to some extent in insuring residential property, although most residences are insured under ordinary policies.

Exercise 9. (*Written*)

1. B. R. Marvin's house is valued at $7,000. He insured it for $4,800 under a policy containing the 80% coinsurance clause. If fire should cause a $3,500 loss to the house, how much would Mr. Marvin receive under his policy?

2. A house valued at $12,000 is insured for $8,800, the insurance policy containing an 80% coinsurance clause. (a) What amount must the company pay in case of a fire loss of $6,000? (b) How much would the owner lose?

3. Find the amount for which the insurance company is liable in each of the following:

	Face of Policy	Amount of Loss	Value of Property	Coinsurance Clause
a.	$36,000	$6,500	$50,000	80%
b.	$16,000	$13,500	$20,000	90%
c.	$6,800	$5,500	$8,500	80%
d.	$28,000	$29,000	$30,000	80%
e.	$21,000	$15,000	$20,000	90%

Division of Fire Loss Among Several Companies. Property is sometimes insured with more than one company. In such cases, when fire damage occurs, the amount of the loss is distributed among the companies in proportion to the amount of each policy.

Example: An apartment house is insured in the Hanover Insurance Company for $25,000 and in the National Insurance Company for $15,000. How much should each company pay on a fire loss of $16,000?

Solution

$$\$25{,}000 + \$15{,}000 = \$40{,}000, \text{ total insurance}$$

$$\frac{\$25{,}000}{\$40{,}000} = \frac{5}{8}, \text{ proportion of loss borne by the Hanover Insurance Company}$$

$$\frac{\$15{,}000}{\$40{,}000} = \frac{3}{8}, \text{ proportion of loss borne by the National Insurance Company}$$

$$\frac{8}{8}, \text{ total}$$

$$\$16{,}000 \times \frac{5}{8} = \$10{,}000, \text{ amount paid by the Hanover Insurance Company}$$

$$\$16{,}000 \times \frac{3}{8} = \$\ 6{,}000, \text{ amount paid by the National Insurance Company}$$

$$\$16{,}000, \text{ total}$$

Exercise 10. (*Written*)

1. An apartment building was insured in the Hartford Insurance Company for $35,000 and in the Saratoga Insurance Company for $25,000. How much should each company pay on a fire loss of $15,000?

2. In each of the following, find each company's share of the fire loss.

	Fire Loss	Amount of Insurance Carried by		
		Standard Company	Fidelity Company	National Company
a.	$ 1,800	$ 4,500	$ 3,000	$ 7,500
b.	3,200	12,000	13,500	4,500
c.	8,250	10,000	5,000	12,500
d.	16,200	24,000	30,000	18,000

3. On a building worth $45,000 the following insurance policies were carried: Traders Insurance Company, $15,000; Mutual Underwriters Company, $10,000; National Insurance Company, $20,000. How much should each company pay in case of a fire loss amounting to $9,450?

Problems for Application and Review

Group A

1. (a) 220 decreased by what part of itself gives 132? (b) Find the interest on $517.50 for 28 days at 6%. (c) Multiply $8,500 by .09846. (d) What amount increased by $\frac{2}{3}$ of itself equals $2.25? (e) $240 is what per cent of $96? (f) $4.80 is 62½% of what amount? (g) Find the interest at 6% on $382.45 for 41 days.

2. Mason insures his house valued at $7,500 at 80% of its value. If the rate is 48¢ per $100, find the amount of the premium.

3. On June 15, E. D. Elliott received from his bank his monthly statement together with the canceled checks. The bank balance according to the statement was $1,710.77. His checkbook balance was $1,242.09. On comparing the returned checks with his checkbook, Elliott found the following checks outstanding: $40.20; $125.68; $75.50; $286.90. One of the returned checks amounting to $50.60 was not recorded in the checkbook. The record on the stub for one check was $78.90 while the canceled check was written for $87.90. Prepare a reconciliation statement.

4. What is the total investment in nine \$500 bonds purchased at $104\frac{1}{4}$ if the brokerage charge is \$13.50?

5. A year ago, C. D. West bought 60 shares of \$100 par, 7% preferred stock at $108\frac{1}{2}$ per share. After receiving dividends for one year, he sells the stock today at $105\frac{3}{4}$ per share. The brokerage and taxes on the purchase amounted to \$32.86 and on the sale, \$35.24. (a) How much did he gain or lose on the sale of the stock? (b) What was his net gain or loss on the transaction?

6. The tax rate for the current year in a certain community is \$25.22 per \$1,000. If property worth \$3,800 is assessed for 80% of its value, find the amount of the tax bill.

Group B

1. (a) 105 is what part smaller than 135? (b) Find the interest at 7% on \$610.25 for 39 days. (c) What amount decreased by $\frac{2}{5}$ of itself equals \$2.25? (d) Divide 817 by 95,000. (e) What number increased by 25% of itself gives 220? (f) Find the interest on \$275.85 for 43 days at 6%.

2. A factory building valued at \$24,000 was insured for \$12,400 under an 80% coinsurance-clause policy. A fire caused a partial loss of \$6,400. How much did the insurance company pay?

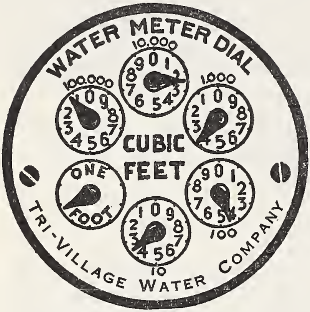
3. Frank Bishop can borrow \$125 from his bank, repaying the loan in five monthly payments of \$25.75 each. He can borrow the same amount from a loan company, repaying the loan in five monthly payments of \$25 each plus interest on the unpaid balance. Interest rates are 3% a month on that part of the loan which does not exceed \$100 and 2% on that part of the loan which exceeds \$100. (a) How much interest would Mr. Bishop pay the bank for the loan? (b) How much interest would he pay the loan company? (c) From which loan institution would it be better to borrow? (d) How much would be saved?

4. What is the rate of income on a 5% bond purchased at $62\frac{1}{2}$?

5. Lewis Jarrett desires to purchase a sufficient number of Republic Power Company $3\frac{1}{2}$% bonds to provide him an annual income of \$1,400. The bonds have a par value of \$1,000 and can be purchased at $106\frac{1}{4}$ plus a \$2.50 brokerage fee per bond. (a) How many of the bonds must he purchase? (b) How much money will he have to invest in the bonds?

6. A building was insured in three companies as follows: National Co., \$8,000; Standard Co., \$9,000; Mutual Co., \$3,000. Find each company's share of a fire loss amounting to \$1,620.

Reading the Water Meter. In most communities water is charged for by the cubic foot. The quantity consumed is measured by a water meter. The illustration at the left shows a typical water meter dial from which periodic readings are taken.



Water Meter Dial

The figures in each of the small dials denote tenths of the number over the dial. Thus, in the "100,000" dial, the figure "1" denotes one tenth of 100,000, or 10,000; the figure "2," two tenths of 100,000, or 20,000; and so on.

To read the meter, begin with the "100,000" or largest dial and read on each dial the last figure the dial hand has passed. By noting the positions of the dial hands you will see that the last figures passed are as follows:

DIAL	100,000	10,000	1,000	100	10
Last figure passed	1	2	3	4	3

The reading on the meter is therefore 12,343 cubic feet. The dial marked "one foot" is used only for testing purposes.

If the previous reading of the meter was 9,201 cubic feet, the amount consumed during the period would be the difference between 12,343 and 9,201, or 3,142 cubic feet.

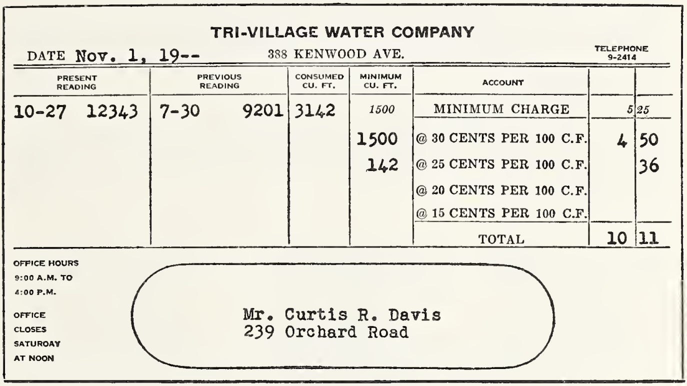
Present reading	12,343 cubic feet
Previous reading	9,201 cubic feet
Amount consumed	3,132 cubic feet

Meter Rates. Water rates vary in different communities. A typical schedule of quarterly rates is shown below.

TRI-VILLAGE WATER COMPANY
QUARTERLY METER RATES FOR WATER

First 1,500 cu. ft. or less	$5.25, minimum charge
Next 1,500 cu. ft.	30¢ per 100 cu. ft.
Next 2,500 cu. ft.	25¢ per 100 cu. ft.
Next 5,000 cu. ft.	20¢ per 100 cu. ft.
Thereafter	15¢ per 100 cu. ft.

Computing the Water Bill. After reading a customer's meter, the water company prepares and sends his water bill. The bill illustrated below is based on the water meter shown on page 246. The bill shows that the present reading is 12,343 cubic feet; the previous reading, 9,201 cubic feet; and the quantity consumed, 3,142 cubic feet.



TRI-VILLAGE WATER COMPANY

DATE Nov. 1, 19-- 388 KENWOOD AVE. TELEPHONE 9-2414

PRESENT READING		PREVIOUS READING		CONSUMED CU. FT.	MINIMUM CU. FT.	ACCOUNT		
10-27	12343	7-30	9201	3142	1500	MINIMUM CHARGE	5	25
					1500	@ 30 CENTS PER 100 C.F.	4	50
					142	@ 25 CENTS PER 100 C.F.		36
						@ 20 CENTS PER 100 C.F.		
						@ 15 CENTS PER 100 C.F.		
						TOTAL	10	11

OFFICE HOURS
9:00 A.M. TO
4:00 P.M.

OFFICE
CLOSES
SATURDAY
AT NOON

Mr. Curtis R. Davis
239 Orchard Road

Quarterly Water Bill

The foregoing charges are based on the schedule of rates shown on page 246. The detailed charges and total bill are:

First 1,500 cu. ft., minimum charge	$ 5.25
Next 1,500 cu. ft. @ 30¢	4.50
Next 142 cu. ft. @ 25¢	.36
Total bill	$10.11

Although the practice varies, some water companies allow the user to deduct a discount if he pays his bill within a specified time.

Exercise 11. (Written)

1. Today, the reading of A. H. Kelsey's water meter is 25,118 cubic feet. Three months ago, the reading was 23,742 cubic feet. (a) How many cubic feet of water have been consumed during the quarterly period just ended? (b) Using the schedule of rates on page 246, find the amount of the water bill for the period.

2. P. H. Engel's water meter read 15,469 cubic feet on March 30 and 22,754 cubic feet on June 30. What should be the amount of his water bill for this quarterly period if the rates are the same as in the schedule on page 246?

3. The monthly rates for water in the town of Danville are as follows: 18¢ per 100 cubic feet for the first 1,000 cubic feet; 15¢ per 100 cubic feet for the next 3,000 cubic feet; 12¢ per 100 cubic feet for the next 5,000 cubic feet; and 9¢ per 100 cubic feet for all over 9,000 cubic feet. Find the amount of O. G. Whalen's water bill for the month of August if his meter showed 10,200 cubic feet used and if he took advantage of the 15% discount allowed for payment within 30 days.

4. Water users in a certain city are billed either monthly or quarterly, as they prefer. The rates for the amount of water used are as follows:

RATES FOR EACH 100 CUBIC FEET	WHEN BILL IS SENT MONTHLY	WHEN BILL IS SENT QUARTERLY
12¢ for 1st	1,000 cu. ft.	3,000 cu. ft.
11¢ for next	9,000 cu. ft.	27,000 cu. ft.
10¢ for next	50,000 cu. ft.	150,000 cu. ft.
9¢ for next	440,000 cu. ft.	1,320,000 cu. ft.
8¢ for next	500,000 cu. ft.	1,500,000 cu. ft.
6¢ for next	2,000,000 cu. ft.	6,000,000 cu. ft.
5¢ for over	3,000,000 cu. ft.	9,000,000 cu. ft.

Minimum Charge: $1.20 per month; $3.60 per quarter.

Woodrow Yockey, owner of a large swimming pool, has his water bill sent on a quarterly basis. During July, August, and September, he uses 171,000 cubic feet of water. What will be his water bill at the end of September?

5. Arthur J. Priest, resident of the city having the above water rates, receives his water bill monthly. He uses the following quantities of water during the year:

January	700 cu. ft.	July	1,500 cu. ft.
February	600 cu. ft.	August	1,900 cu. ft.
March	900 cu. ft.	September	1,800 cu. ft.
April	900 cu. ft.	October	1,500 cu. ft.
May	1,100 cu. ft.	November	1,100 cu. ft.
June	1,200 cu. ft.	December	800 cu. ft.

(a) Find the water bill for each month. (b) What is the average monthly water bill?

Problems for Application and Review

Group A

1. (a) Express $\frac{7}{8}\%$ as a decimal. (b) Find the interest on $428.70 for 33 days at 6%. (c) 216 is what per cent greater than 96? (d) Find the interest at 6% on $362.50 for 34 days.

2. Merriman's water meter read 92,364 cu. ft. on June 15 and 103,010 cu. ft. on September 15. Using the schedule of rates on page 246, find the amount of his water bill for the period.

3. A residence valued at $15,000 was insured for $10,800 under a policy with an 80% coinsurance clause. A fire caused a loss of $5,500. (a) How much did the insurance company pay? (b) How much was the owner's loss? (c) What per cent of the total fire loss was borne by the owner?

4. A United States Savings Bond bought today for $18.75 will mature in 10 years and be worth $25. How many of these bonds must we buy today in order that their maturity value shall be $375?

5. A real estate agent sold a piece of property for Gifford for $16,500. How much did Gifford receive if the agent deducted $88.35 for expenses and 5% for his commission?

Group B

1. (a) 200 is what part smaller than 320? (b) Find the interest at 5% on $542.75 for 22 days. (c) 448 is $\frac{3}{4}$ greater than what number? (d) Find the interest on $625.40 for 44 days at 6%.

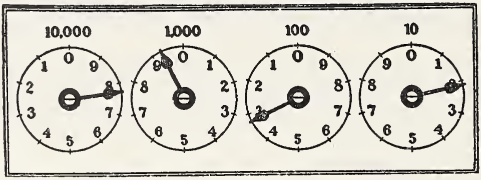
2. On June 20, Baer's water meter read 84,757 cu. ft. The reading on March 20 was 78,409 cu. ft. Using the schedule of rates on page 248, find the amount of Baer's water bill for the period.

3. A savings bond bought today for $37.50 will mature in 10 years and be worth $50. How many of these bonds must we buy today in order that their maturity value shall be $1,750?

4. R. L. Harbin's investments consist of $9,000, par value, of 4% bonds purchased at 110 and $12,000, par value, of 3% bonds purchased at 85. What is the rate of return, to the nearest tenth per cent, on his total investment?

5. George Howe buys a house as an investment for $7,500. His annual expenses and upkeep are as follows: taxes, $75.25; insurance, $18.15; depreciation and repairs, $223.10. What rent per month must he receive to realize $4\frac{1}{2}\%$ on his investment?

Reading the Electric Meter. Electricity is now available to practically all homes, usually being provided by a municipal or privately owned company. The *kilowatt-hour* (abbreviated as K.W.H. or kw-hr) is the unit of work or energy used in the electrical business to measure the consumption of electricity.



Electric Meter

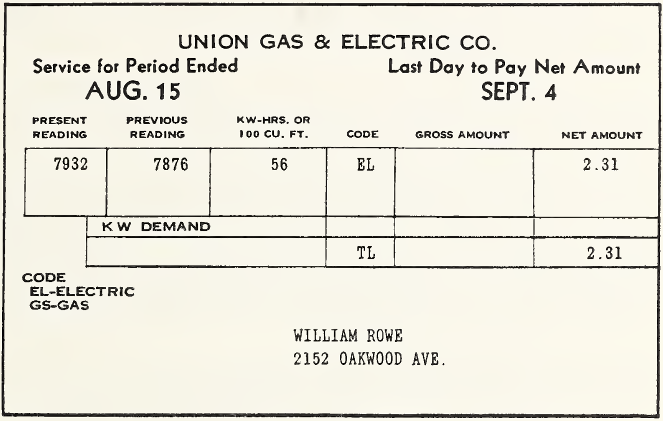
The electricity used by a homeowner is measured by a meter, somewhat like a water meter. The electric meter in the illustration above consists of four dials. The dials are read from left to right, in the same manner as a water meter, the last figure passed by each pointer being the figure that is read. In the meter shown above, the last figures passed are seen to be as follows:

Dial	10,000	1,000	100	10
Last figure passed	7	9	3	2

The reading on the meter is therefore 7,932, which means 7,932 kilowatt-hours.

If the pointer is exactly on a number, the next smaller dial will indicate whether it has actually passed the number, for if the pointer on the next smaller dial has passed zero, the revolution has been completed. Thus, if the pointer on the "100" dial is at 8, and the pointer on the "10" dial is between 0 and 1, the revolution on the "10" dial has been completed, and the correct reading of the meter is 80. If, however, the pointer on the "10" dial is between 9 and 0, the revolution on the "10" dial has not been completed, and the correct reading is 79.

Computing the Electric Bill. The monthly readings taken by the electric company constitute the basis upon which a customer's bill is calculated. The bill of William Rowe, illustrated on page 251, is based on the meter illustrated above. Both the present reading, 7,932, and the reading a month prior, 7,876, are shown. The difference, 56, is the number of kilowatt-hours used during the month.



UNION GAS & ELECTRIC CO.

Service for Period Ended
AUG. 15

Last Day to Pay Net Amount
SEPT. 4

PRESENT READING	PREVIOUS READING	KW-HRS. OR 100 CU. FT.	CODE	GROSS AMOUNT	NET AMOUNT
7932	7876	56	EL		2.31
	K W DEMAND				
			TL		2.31

CODE
EL-ELECTRIC
GS-GAS

WILLIAM ROWE
2152 OAKWOOD AVE.

Electric Bill

The total charge shown on the bill, $2.31, is based upon the electric company's schedule of rates shown below.

UNION GAS AND ELECTRIC Co.

Net Monthly Electric Rate

First	15 K.W.H., or less	$0.75
Next	45 K.W.H.	3.8¢ per K.W.H.
Next	140 K.W.H.	2.5¢ per K.W.H.
Over	200 K.W.H.	1.5¢ per K.W.H.

Users of electricity are usually required to pay a certain minimum amount a month whether or not any electricity is used. The minimum in the case of the Union Gas and Electric Co. is .$75.

The cost of the 56 kilowatt-hours of electricity used by Mr. Rowe is computed as follows:

First 15 K.W.H.	$0.75
Next 41 K.W.H. at 3.8¢	1.56
Net amount of bill	$2.31

Exercise 12. (Written)

In working these problems, use the schedule of rates given on page 251.

1. Thomas Henderson's electric bill for April shows a reading of 3,463 for April 30 and a reading of 3,317 for March 31. What is the amount of the bill?

2. Louis Lefevre's electric meter last month read 7,843. The reading this month is 8,111. (a) How many kilowatt-hours were used during the month? (b) What is the monthly bill?

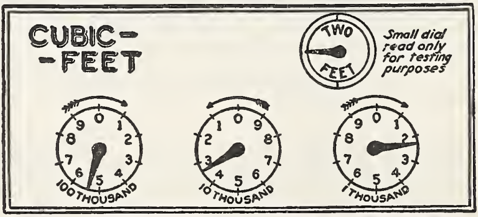
3. In June James Baker's family used 156 kilowatt-hours of electricity. On July 1 Mr. Baker purchased an electric refrigerator. His July bill showed that 189 kilowatt-hours had been used. (a) If the use of electricity for other purposes remained the same, how many kilowatt-hours were required to operate the refrigerator? (b) What was the monthly increase in the electric bill resulting from the use of the refrigerator?

4. The July and August meter readings of certain customers of the Palmer Gas and Electric Company are as follows:

USER	METER READINGS		KILOWATT-HOURS USED	AMOUNT OF BILL
	July 31	*August 31*		
Harold Osborne	384	509	?	?
Ray McCoy	1206	1417	?	?
Richard Smith	863	1101	?	?
Harold Conklin	163	581	?	?
William Wilson	1468	1494	?	?

Find (a) the number of kilowatt-hours used by each customer, and (b) the amount of each customer's bill.

Reading the Gas Meter. For cooking and heating purposes, many homes use natural or artificial gas. Gas is measured in cubic feet by a meter as shown below.



Gas Meter

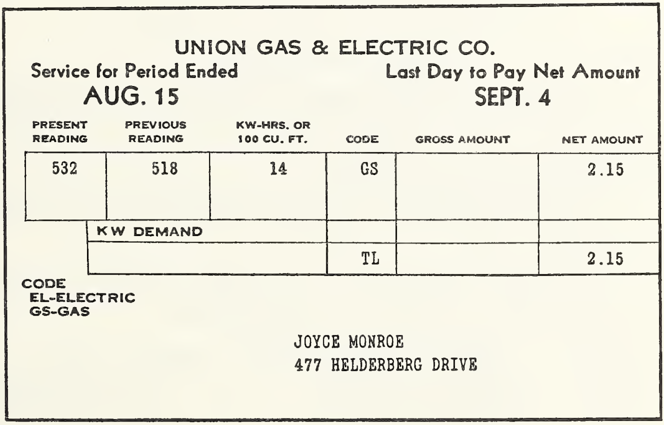
The gas meter dials are read from left to right, in the same manner as a water meter or an electric meter. The reading on each dial is the last figure the dial pointer has passed. On the gas meter illustrated above, the last figures passed by the dial pointers are as follows:

Dial	100 Thousand	10 Thousand	1 Thousand
Last figure passed	5	3	2

Each figure on the dial marked "1 Thousand" represents 100 cubic feet. Hence it is necessary to annex two ciphers to the reading indicated by the dials in order to show the reading in cubic feet. Thus, the reading on the meter illustrated above indicates 53,200 cubic feet.

Many gas companies omit the two ciphers, recording and reporting meter readings in units of 100 cubic feet. In this manner, the reading on the meter in the illustration would be recorded and reported as "532," meaning 532 hundred cubic feet.

Computing the Gas Bill. The bill of Miss Joyce Monroe, illustrated below, is based on the meter illustrated on page 252.



UNION GAS & ELECTRIC CO.

Service for Period Ended
AUG. 15

Last Day to Pay Net Amount
SEPT. 4

PRESENT READING	PREVIOUS READING	KW-HRS. OR 100 CU. FT.	CODE	GROSS AMOUNT	NET AMOUNT
532	518	14	GS		2.15
	KW DEMAND				
			TL		2.15

CODE
EL-ELECTRIC
GS-GAS

JOYCE MONROE
477 HELDERBERG DRIVE

Gas Bill

As the meter reading the previous month was 51,800, 1,400 cubic feet of gas have been consumed during the month. This is the amount for which the user, Joyce Monroe, is billed. The readings on the bill are shown in units of 100 cubic feet.

The rates of the Union Gas and Electric Company are:

UNION GAS & ELECTRIC CO.
NET MONTHLY GAS RATE

First	400 cu. ft. or less a month....	$1.10
Next	1,200 cu. ft. a month...........	10.5¢ per 100 cu. ft.
Next	1,200 cu. ft. a month...........	9.0¢ per 100 cu. ft.
Next	1,800 cu. ft. a month...........	7.5¢ per 100 cu. ft.
All over	4,600 cu. ft. a month...........	4.8¢ per 100 cu. ft.

Users of gas are generally required to pay a certain minimum amount a month whether or not any gas is used. The minimum in the case of the Union Gas and Electric Company is $1.10.

The calculation of the bill shown on the preceding page is as follows:

First 400 cu. ft.	$1.10
Next 1,000 cu. ft. at 10.5¢ per 100 cu. ft....	$1.05
Amount of bill.........................	$2.15

Exercise 13. (*Written*)

1. On Barbara Anderson's January gas bill the present reading is "364," the previous reading, "319." (a) How much gas did she use during the month? (b) Find the amount of her gas bill, using the schedule of rates given above.

2. Using the schedule of rates given above, find the amount of G. B. Filmore's gas bill for the month of March if he used 4,300 cubic feet.

3. The South Counties Gas and Electric Company supplies customers with natural gas at the following rates:

First	500 cu. ft. or less a month....	$1.25	
Next	500 cu. ft. a month..........	.15	per 100 cu. ft.
Next	2,000 cu. ft. a month..........	.09	per 100 cu. ft.
Next	7,000 cu. ft. a month..........	.065	per 100 cu. ft.
Next	10,000 cu. ft. a month..........	.05	per 100 cu. ft.
Next	20,000 cu. ft. a month..........	.045	per 100 cu. ft.
Next	90,000 cu. ft. a month..........	.04	per 100 cu. ft.
All over	130,000 cu. ft. a month..........	.03	per 100 cu. ft.

Last month Thomas Harvey used 2,600 cubic feet of gas. What was the amount of his bill?

4. Given below are the meter readings shown on the bills of several customers of the South Counties Gas and Electric Company:

USER	METER READINGS		CU. FT. OF GAS USED	AMOUNT OF BILL
	Present	*Prior*		
Walter Thomas.........	313	296	?	?
Frank Hahn............	743	627	?	?
Barbara Conklin........	896	860	?	?
Claire Hardiman........	155	151	?	?
Mrs. Gladys Davis......	97	58	?	?

Find (a) the cubic feet of gas consumed by each user, and (b) the amount of each user's bill.

5. Arlen Scott, a customer of the South Counties Gas and Electric Company, desires to keep a record of the amount of gas his family uses each month. He finds, however, that he has lost his receipted gas bill for March. He looks in his checkbook and finds that the check written for the March gas bill was $2.81. How many cubic feet of gas did his family use during March?

Problems for Application and Review

1. (a) $2.28 is $\frac{3}{4}$ of what amount? (b) What amount is $83\frac{1}{3}\%$ larger than $16.20? (c) What per cent of $19 is $28.50? (d) Find the interest at 6% on $291.27 for 45 days.

2. Clark's electric meter on December 2 read 23,469 K.W.H. A month later it read 23,592 K.W.H. At an average of $4\frac{1}{2}$¢ per K.W.H., find the amount of Clark's electric bill.

3. The June reading of a gas meter was 53,400 cu. ft. while the May reading was 50,800 cu. ft. At $1.05 per thousand cu. ft., find the amount of the gas bill.

4. Martin insured a building valued at $12,500 for 80% of its value at 75¢ per $100 for three years. What was the amount of the premium?

5. Dodd desired to purchase a four-family apartment house in which each of the four tenants was paying $60 a month rent. He estimated the following annual expenses: taxes, $720; insurance, $35; depreciation and repairs, $460; other expenses, $195. What could he afford to pay for the apartment house to receive a net return of 7% on his investment?

Cumulative Review

1. What is the average cost per pound of a mixture of tea consisting of 25 lb. @ 88¢, 20 lb. @ $1.15, and 15 lb. @ $1.20?

2. A sales clerk receives a salary of $37.50 a week and a commission of 4% on all sales in excess of $750 in any single week. What must be the amount of her sales each week in order that her total weekly earnings may be $45?

3. During one year a store's sales were: fruits, $14,760; vegetables, $16,660. The preceding year the sales were: fruits, $14,400; vegetables, $17,500. Find the per cent increase or decrease in sales for each commodity.

4. A man paid $781.25 in full settlement of the principal and interest on a loan of $750 for 10 months. What rate of interest did he pay?

5. Find (a) the due date and (b) the amount due at maturity on a 75-day, 5% note for $1,262.75, dated June 9.

6. A savings bond bought today for $75 will be worth $100 when it matures in 10 years. How much must we invest in these bonds today in order that their maturity value shall be $1,500?

7. J. R. Mosely bought 70 shares of $100 par, 4% preferred stock at 82 plus brokerage and taxes totaling $32.77. He received dividends for one year, then sold the stock at 84. Expenses incurred in the selling of the stock were brokerage and taxes totaling $35.81. (a) What was his profit on the sale of the stock? (b) How much did he receive in dividends? (c) What was his total gain on the transaction?

8. J. A. Massey deposited 50 shares of Arco Oil stock with his broker with instructions to sell the stock at 24 and buy 30 shares of Colonial Corporation stock at 38. The broker's commission was $14.40 on the sale and $14.13 on the purchase. Taxes on the sale amounted to $5.03; on the purchase, $.36. What was the unexpended balance left to Mr. Massey's credit?

9. A store property worth $28,000 rents for $3,000 a year. Annual repairs cost $1\frac{1}{4}$% of the value of the property. Taxes are paid at the rate of $3.192 per $100 on an assessed valuation of $25,000. Annual insurance is paid at the rate of 80¢ per $100 on a $15,000 policy. Other expenses total $415 annually. The annual net income is what per cent of the value of the property, computed to the nearest tenth per cent?

UNIT VIII

TRAVEL AND TRANSPORTATION

Section 1 . . . Automobile

Expense of Automobile Ownership. The expenses connected with the ownership of an automobile include all money payments for license fees, insurance, garage rent, gasoline, oil, tires, repairs, and general maintenance and upkeep.

Besides the money payments, the owner should include interest on the original cost of the car. This interest allowance represents the loss of income that might have been received had the owner chosen to invest the money in some form of income-producing property, such as stocks, bonds, or a savings account.

The owner should also include among the expenses of car ownership the amount lost through the decrease in value, or depreciation, of the car.

Automobile Depreciation. The term *depreciation* refers to the loss of value of an article through use and the passage of time. An automobile, for example, decreases in value as it grows older. Regardless of the care taken of it, the time comes when it is no longer serviceable or worth repairing. At that time, the old car may be traded in as part payment on a new one or sold as scrap.

The depreciation of the car is the difference between its original. cost and the amount received for it when it is replaced or discarded. Thus, if a car owner buys a car for $2,000 and five years later is allowed $450 for it toward the purchase of a new car, the depreciation of the old car over the five-year period is $2,000 − $450, or $1,550.

$2,000	Original Cost
450	Trade-in Value
$1,550	Depreciation

Cost of Automobile Transportation. The total cost of automobile transportation is the sum of all expenses incurred in the car operation, including depreciation and interest on the original cost.

Example: Robert Owens paid $2,000 for an automobile that he traded in five years later toward a new car, receiving a trade-in allowance of $450. His record of income and expenditures for the five-year period shows total payments of $2,348 for taxes, gasoline, oil, repairs, and other maintenance expenses. (a) Allowing 2% interest on the original cost, find the total cost of operating the car for the five-year period. (b) Find, to the nearest tenth of a cent, the average cost per mile if the car was driven 60,000 miles.

Solution:

(*a*)	*Depreciation ($2,000 — $450)*	*$1,550*	
	Interest on $2,000 for 5 yr. @ 2% ($2,000 × .02 × 5)	*200*	
	Taxes, gasoline, oil, repairs, etc.	*2,348*	
	Total operating cost	*$4,098*	*Ans.*

(*b*) *$4,098 ÷ 60,000 = $.0683, or 6.8¢ per mile. Ans.*

Exercise 1. (*Written*)

1. S. J. Norton purchased a new automobile for $2,200. He used the car for six years and sold it for $565. What was the total depreciation of the car for the six-year period?

2. An automobile that cost $2,375 four years ago can be traded in today for $895. What is the total depreciation?

3. R. G. Russell purchased a new automobile for $2,350. He kept the car for two years during which time he drove the car 55,000 miles and spent a total of $2,156 for license plates, insurance, gasoline and oil, repairs, and other operating expenses. He then was allowed $1,100 for it toward the purchase of a new car. (a) What was the depreciation of the car over the two-year period? (b) Allowing 2% interest per annum on the original cost, what was the total cost of operating the car for the two years? (c) What was the average cost per mile to the nearest tenth of a cent?

4. Bert Hagen bought a car for $2,250. He used the car seven years and then sold it for $525. For the seven years, his car expenses, in addition to the depreciation, were: gasoline, oil, and grease, $1,064; insurance, $595; repairs and miscellaneous expenses,

$575; license plates, $105; interest on the investment (original cost), 2% per annum. (a) What was the total depreciation of the car? (b) What was the total car expense for the seven years? (c) If the car was driven 48,000 miles, what was the average cost per mile of operating the car? (Express answer to the nearest tenth of a cent.)

Exercise 2. (*Written*)

1. What will be the cost of license plates for an automobile weighing 3,300 pounds if the rate is 50 cents for each 100 pounds?

2. If a car used 14 gallons of gasoline on a trip of 215 miles, how many miles, to the nearest tenth of a mile, did it average per gallon of gasoline?

3. On a trip of 540 miles, P. C. Cadby used 32 gallons of gasoline costing 28.7 cents per gallon. (a) What was the total cost of the gasoline used on the trip? (b) What was the cost of the gasoline per mile traveled, computed to the nearest tenth of a cent? (c) How many miles did he average per gallon, to the nearest tenth of a mile?

4. Upon starting on a trip in his car, Carl Ditzel noted that his speedometer read 39,877 miles. At the end of the trip it read 40,101 miles. (a) How many miles did he travel? (b) If he was on the road seven hours, what was his average speed in miles per hour?

5. On a holiday pleasure ride, the H. A. Metcalf family drove 75 miles and was on the road $3\frac{3}{4}$ hours. What was the average speed in miles per hour?

Annual Cost of Automobile Transportation. A car owner may wish to determine the total operating cost each year. In such cases, the interest allowance for one year can be readily computed, and the expenses represented by the money payments for the year can be obtained from the owner's record of income and expenditures. Depreciation of the car for the year, however, can only be estimated, because the actual depreciation cannot be determined until the car is traded in or sold.

Computing the Annual Automobile Depreciation. Four factors are involved in computing the estimated annual depreciation:

1. The original cost of the car
2. The estimated number of years in the service life of the car
3. The estimated trade-in or scrap value of the car
4. The method of spreading the estimated total depreciation over the service life of the car

The simplest method of spreading the total depreciation expense is to apportion it uniformly over the estimated service life. Under this method, the annual depreciation is computed by dividing the estimated total depreciation by the estimated years of service life. This is commonly known as the *straight-line method* of spreading the depreciation.

Example: If the estimated life of an automobile costing $2,000 is eight years, and its estimated trade-in or scrap value is $200, what is the average annual depreciation?

Solution:

$2,000 Original Cost
200 Trade-in Value
$1,800 Total Depreciation
$1,800 ÷ 8 = $225, Average Annual Depreciation. Ans.

Exercise 3. (*Written*)

1. An automobile that cost $1,900 four years ago can be traded in today for $560. (a) What is the total depreciation? (b) What is the average annual depreciation?

2. Fred Dorn bought an automobile for $2,500 and used it for $5\frac{1}{2}$ years. He then was allowed $685 for it toward the purchase of a new car. What was the average yearly amount of depreciation?

3. An automobile that cost $2,250 three and one half years ago is now worth only $745. What is the average annual amount of depreciation?

4. W. P. Haber purchased a new car for $2,000. He estimated the life of the car would be three years, at the end of which time the car would have a trade-in value of $350. For the first year, the expenses of operating the car, in addition to the depreciation, were as follows: insurance, $138; repairs, $50; gasoline, oil, and grease, $655; license plates, $20; interest on investment (original cost), $2\frac{1}{2}\%$. (a) What is the annual depreciation of the car? (b) What was the total cost of operating the car the first year? (c) If the car was driven 30,000 miles the first year, what was the average cost per mile, to the nearest tenth of a cent?

Rate of Depreciation. Under the straight-line method of spreading depreciation, the average annual depreciation is often expressed as a per cent of the original cost. The average annual depreciation therefore represents the part; and the original cost represents the base, or whole, with which the part is compared. Hence the formula:

$$\textbf{Rate of Depreciation} = \frac{\textbf{Average Annual Depreciation}}{\textbf{Original Cost}}$$

Thus, if the average annual depreciation of an automobile is \$600 and the original cost is \$2,000, the rate of depreciation is 30%.

$$\text{Rate of Depreciation} = \frac{\$600}{\$2,000} = .3 = 30\%$$

Exercise 4. (*Written*)

1. C. V. Atkins bought an automobile for \$2,400 and used it for six years. He then was allowed \$600 for it toward the purchase of a new car. (a) What was the total depreciation? (b) What was the average annual depreciation? (c) The average annual depreciation is what per cent of the original cost?

2. W. M. Fisher purchases an automobile for \$2,250. He estimates that the car will be serviceable for four years and that it will then have a trade-in value of \$630. (a) What is the estimated average annual depreciation? (b) What is the estimated rate of depreciation?

3. A car costing \$1,800 was traded in for \$585 at the end of $4\frac{1}{2}$ years. What was the average annual rate of depreciation?

4. If a car costing \$2,400 can be traded in at the end of three years for \$816, what is the rate of depreciation?

5. A man bought a car for \$2,600 and during the first year drove it 12,500 miles. His car expenses for the year were: gasoline and oil, \$266; repairs and miscellaneous expenses, \$47; insurance, \$95; license plates, \$17; interest on the investment at $2\frac{1}{2}\%$; depreciation at 20%. (a) Find the total car expense for the year. (b) Find the operating cost per mile, to the nearest tenth of a cent.

6. Robert Harrington bought a new car for \$2,450. His car expenses for one year were: insurance, \$97.45; license plates, \$19; gasoline and oil, \$325.52; repairs and upkeep, \$46.18; interest on original investment at 3%; depreciation at $17\frac{1}{2}\%$. (a) What was the total car expense for the year? (b) If he drove the car 15,000 miles during the year, what was the average car expense per mile, computed to the nearest tenth of a cent?

Problems for Application and Review

Group A

1. (a) Multiply $13,500 by .0635. (b) $36 is ⅙ smaller than what amount? (c) What per cent less than 168 is 140? (d) Find the interest at 4% on $842.70 for 11 days.

2. Perry drove from his home to Fresno, a distance of 144 miles, in 4½ hours. What was his average speed in miles per hour?

3. An automobile that cost $1,990 six years ago is now worth only $370. What is the average yearly amount of depreciation?

4. What amount must be invested in Standard Packing Company 3½% bonds at 91⅞ in order to produce an annual income of $1,400?

Assume a par value of $100 or $1,000 and solve accordingly.

5. The regulated factory hours of a certain clothing company provide for a week consisting of 7 hours a day from Monday to Thursday and 8 hours on Friday, with time and a half for overtime. Brown, a cutter employed in this factory at $2.10 an hour, worked during the past week as follows: Monday, 7 hours; Tuesday, 8 hours; Wednesday, 8½ hours; Thursday, 9 hours; Friday, 8 hours. Find the amount of Brown's wages for the week.

Group B

1. (a) Divide 43,688 by 215,000. (b) 210 is what part smaller than 245? (c) $5.60 is 37½% less than what amount? (d) Find the interest on $359.40 for 71 days at 6%.

2. Before buying an automobile you estimate the first year's expenditures as follows: cost of automobile, $2,050; license, $15; insurance, $99.50; depreciation, 25% of the cost of the car; accessories and repairs, $38.82; gasoline and oil, $334; interest on investment (cost of car), 3%. Find the cost of operating the car the first year.

3. An automobile that cost $2,260 four years ago can be traded in today for $700. What is the average annual depreciation?

4. What was Dixon's average speed in miles per hour if he drove 90 miles in 3 hours and 45 minutes?

Change the minutes to a fraction of an hour before dividing.

5. If Interstate Cotton Mills 3¾% bonds can be purchased at 100⅜, what amount must be invested in the bonds in order to produce an annual income of $2,100?

Section 2 . . . Automobile Insurance

Kinds of Automobile Insurance. The most common types of automobile insurance are the following:

Bodily Injury, which protects the insured against loss arising from his liability for injury to other persons. The insurance company is liable only to the extent stated in the policy. Standard limits are $5,000 for injury to one person and $10,000 when more than one person is injured in any one accident.

Property Damage, which protects against loss arising from damage to other people's property. The standard limit is $5,000.

Comprehensive Damage, which protects the insured against loss from damage to his own car except that caused by collision or upset. It includes loss caused by fire, theft, vandalism, missiles, falling objects, windstorm, hail, lightning, and flood.

Collision Insurance, which protects against loss arising from damage to one's own car resulting from collision or upset. Various degrees of coverage are available. A popular coverage is the "$50-Deductible," under which the insured bears $50 of the loss and the insurance company the remainder.

Automobile Insurance Rates. A series of automobile insurance rate charts have been prepared for each state, each one of which is divided into districts. Rates are higher in densely populated areas where traffic is heavy.

Rates for Bodily Injury and Property Damage. Rates for bodily injury and property damage are divided into three classes.

Class	Description
1	Cars not used for business purposes; no operator under age 25. This class carries the lowest rate.
2	Cars used for business or non-business purposes; operator under 25. This class carries the highest rate.
3	Cars used for business purposes; no operator under 25.

Rates for Comprehensive Damage and Collision. In each district, the rates for comprehensive damage and collision insurance vary according to the make and age of the car. Also, in the case of collision insurance, rates vary according to the kind of coverage. For example, the rates are considerably higher for a $50-deductible policy than for a $100-deductible.

Rate Schedules. There are so many different districts and makes of cars that a great many pages are required to show the rates for all. The abbreviated schedules shown below will suffice, however, to illustrate how the premiums are calculated.

Table 1. Bodily Injury and Property Damage

TYPE OF INSURANCE	LIMITS	CLASS OF USE		
		1	2	3
Bodily Injury	$5/10,000	$58.00	$101.00	$84.00
Property Damage	$5,000	22.00	37.00	31.00

Table 2. Rates for Higher Limits

BODILY INJURY		PROPERTY DAMAGE	
MAXIMUM LIMITS	PER CENT OF $5/10,000 PREMIUM	MAXIMUM LIMITS	PER CENT OF $5,000 PREMIUM
$10/20,000	120%	$10,000	110%
$20/30,000	131%	$15,000	115%
$25/50,000	136%	$20,000	118%

Table 3. Comprehensive Damage and Collision (Chevrolet, Ford, and Plymouth 4-Door Sedans)

TYPE OF INSURANCE	AGE OF CAR IN MONTHS			
	0 - 6	6^+ - 18	18^+ - 30	30^+
Comprehensive[1]	$ 8.00	$ 7.00	$ 6.00	$ 5.00
Collision ($50-Ded.)[2]	62.00	62.00	56.00	56.00

[1] Minimum charge $8.00

[2] Subject to 10% reduction, adjusted to nearest dollar, if all drivers are over 25.

The rates shown are for a typical medium-rate district. Comprehensive damage and collision rates are shown for one classification of cars only; namely, Chevrolet, Ford, and Plymouth four-door sedans.

Using the Rate Schedules. Suppose an insurance agent wishes to find the total premium John West must pay for coverage on his one-year-old Ford. The car is not used for business purposes and is not operated by anyone under age 25. Mr. West wishes to purchase bodily injury coverage for $10/20,000; property damage for $10,000; comprehensive damage; and $50-deductible collision insurance. Because of the way it is used, the car takes Class 1 rates for bodily injury and property damage.

To determine the premiums, the agent proceeds as follows:

Bodily Injury: Table 1 shows that for Class 1 use the premium is $58 for limits of $5/10,000. Table 2 shows that the premium for limits of $10/20,000, which Mr. West desires, is 120% of the $5/10,000 premium. Hence, the premium for $10/20,000 coverage is $58 x 1.2, or $69.60.

Property Damage: Table 1 shows that for Class 1 use the premium is $22 for $5,000 coverage. Table 2 shows that the premium for $10,000 coverage, which Mr. West desires, is 110% of the premium for $5,000. Hence, the premium for $10,000 coverage is $22 x 1.10, or $24.20.

Comprehensive: In Table 3, in the column headed "6^+ - 18," the age grouping into which this car falls, the premium is shown to be $7. The footnote, however, says that the minimum charge for one year is $8. Hence, Mr. West will have to pay $8 for the comprehensive coverage.

> If he were purchasing coverage for two years instead of one, the premium for the current year would be $8, the minimum charge. The premium for the next year would be $6, as shown in the column headed "18^+ - 30." The total premium for the two years would be $8 + $6, or $14.

Collision: Table 3, in the column headed "6^+ - 18," shows that the premium is $62. However, since no driver under 25 operates the car, this premium is subject to a 10% reduction, adjusted to the nearest dollar, as indicated in the footnote. Hence, the premium Mr. West will pay is $62 − $6, or $56.

Total Premium: Adding the four premiums, the agent will find that the total is $157.80, the amount Mr. West must pay for the coverage desired.

Exercise 5. (*Written*)

1. Find the total annual premium for bodily injury and property damage coverage on each of the following Plymouth 4-door sedans.

	Class of Use	Maximum Limits			Class of Use	Maximum Limits	
		Bodily Injury	Property Damage			Bodily Injury	Property Damage
a.	1	$5/10,000	$5,000	d.	1	$10/20,000	$10,000
b.	3	$5/10,000	$5,000	e.	2	$20/30,000	$10,000
c.	2	$10/20,000	$10,000	f.	1	$20/30,000	$20,000

2. Find the total premium for one year for comprehensive and $50-deductible collision coverage on each of the following Chevrolet 4-door sedans.

	Age of Car	All drivers over 25		Age of Car	All drivers over 25
a.	4 mo.	Yes	e.	16 mo.	Yes
b.	1 yr.	Yes	f.	22 mo.	No
c.	2 yr.	Yes	g.	4 yr.	No
d.	3 yr.	No	h.	New	Yes

3. On his new Ford 4-door sedan, E. Dunn purchases $10/20,000 bodily injury and $10,000 property damage coverage for one year. The car will not be used for business purposes, but there is an operator in the family who is under 25. Find the total premium.

4. Ervin Dunn, in Problem 3, also purchases comprehensive and $50-deductible collision coverage for one year. Find the total cost of this coverage.

5. On his new 4-door Plymouth sedan, Carl Holt purchases the following coverage for one year: $20/30,000 of bodily injury; $20,000 of property damage; comprehensive; and $50-deductible collision. There is an operator in the family who is under 25. Find the total premium.

6. Eva Volk, aged 24, insured her new Chevrolet 4-door sedan against collision, with $50 deductible. Four months later, her car was damaged in a collision, and the repair bill amounted to $416.75. (a) How much was the premium? (b) How much did she receive from the insurance company in settlement of the repair bill?

Problems for Application and Review

1. (a) Express $\frac{5}{8}\%$ as a decimal. (b) Add 47.58; 299.3; 3.975; and 95.66. (c) Subtract 597.32 from 913.9. (d) Divide 3,586.72 by 11.6. (e) Multiply 208.3 by 6.97. (f) Divide $14\frac{1}{6}$ by $1\frac{2}{3}$.

2. A radio which cost $350 when new had a trade-in value of $161 after 6 years of use. What was the average annual per cent of depreciation.

3. Aylmer owned 50 shares of stock which paid a quarterly dividend of $.60 per share. What amount of money did he receive as dividends during a period of one year?

4. A stove may be purchased for $200, or on the installment plan by paying $80 down and 8 monthly installments of $20 each. By what per cent does the installment price exceed the cash price?

5. Davern, a commission agent, kept $150 as his commission on a sale and turned the net proceeds of $750 over to his employer. What per cent commission did he earn on this transaction?

Section 3 . . . Railroad, Bus, Airplane, and Boat

Public Travel Agencies. For the individual who does not care to use his automobile, the public travel agencies available are the railroad, the motor bus, the airplane, and the steamboat. Of these the railroad is perhaps the most commonly used. It provides a relatively speedy and inexpensive means of transportation. Travel by bus is considerably cheaper but slower than by railroad. The fastest but most expensive method of travel is by airplane. The time saved in traveling by plane, however, frequently more than offsets the extra cost. The slowest method of travel is by boat.

Exercise 6. (*Written*)

In solving the problems in this exercise, use the table given below at the right. The table shows the New York Central System timetable for Train No. 51 from New York to Buffalo.

Miles		51 Daily
		AM
0	Lv New York (Grand Central Terminal)...	8 00
32.7	Lv Harmon............	8 48
142.2	Ar Albany............	10 43
	Lv Albany............	10 48
236.8	Ar Utica...............	12 26
	Lv Utica...............	12 31
289.6	Ar Syracuse............	1 24
	Lv Syracuse............	1 29
369.9	Ar Rochester..........	2 43
	Lv Rochester..........	2 47
435.9	Ar Buffalo............	4 00

1. (a) How far is it from Harmon to Syracuse? (b) From Albany to Rochester? (c) From Utica to Buffalo?

2. (a) How long does it take to travel from New York to Utica? (b) From Syracuse to Buffalo? (c) From Utica to Rochester? (d) From Albany to Syracuse?

3. (a) At what average speed in miles per hour, to the nearest mile, does Train No. 51 travel from New York to Albany? (b) From Rochester to Buffalo? (c) From Syracuse to Rochester?

4. If Train No. 51 is running 30 minutes late, at what time should it arrive in (a) Syracuse? (b) Utica? (c) Albany?

5. (a) If the rate of fare is about 3.4 cents a mile, what would be the approximate fare from New York to Utica? (b) What would be the approximate total cost of the ticket if the Federal government imposes on the traveler a transportation tax of 15%?

Exercise 7. (*Written*)

1. The railroad fare from St. Louis to Indianapolis is $8.53. If the distance is 240 miles, what is the fare per mile, computed to the nearest tenth of a cent?

2. The cost of a one-way ticket between Chicago, Illinois, and Harrisburg, Pennsylvania, is $24.12 and a round-trip ticket, $41.05. (a) If Marion Smith is traveling from Chicago to Harrisburg and return, how much does she save by purchasing a round-trip ticket instead of two one-way tickets? (b) What per cent does she save, computed to the nearest per cent?

3. A one-way ticket over the San Francisco-Oakland Bay Bridge between San Francisco and East Bay cities can be purchased for 35 cents. A twenty-ride commutation book of tickets can be bought for $6.50. (a) If Grace Clark averages twenty round trips a month between Berkeley and San Francisco, what will be the cost of forty tickets for the twenty round trips at the one-way rate? (b) How much would she save a month by purchasing two commutation books of twenty rides each? (c) What per cent would she save, to the nearest tenth per cent?

4. Train No. 12 leaves Market Street, San Francisco, at 5:00 p.m. daily and arrives at Portland, Oregon, 9:30 the following morning. The cost of a first-class ticket on this train is $29.07. A bus leaves San Francisco at 5:30 p.m. daily and arrives at Portland 2:25 the next afternoon. The bus ticket costs $11.47. (a) How much time is saved by taking the train? (b) How much money is saved by taking the bus? (c) By what per cent, to the nearest per cent, is the cost by bus less than the cost by train? (d) By what per cent, to the nearest per cent, is the cost by train more than the cost by bus?

5. The distance from Chicago to New York according to an air line mileage chart is 720 miles. A passenger plane makes the trip in 2 hours and 50 minutes, and the cost of the fare is $50.72. (a) What is the average speed of the plane in miles per hour, to the nearest mile? (b) What is the cost per mile, to the nearest tenth of a cent?

6. A Canadian Pacific boat leaves Seattle for Vancouver, B. C., a scenic trip, at 9 a.m. and arrives at Vancouver at 6:25 p.m. the same day. A one-way ticket is $7.48. The Great Northern train leaves Seattle at 7:45 a.m. and arrives at Vancouver at 11:45 a.m. the same day. The cost of the train ticket is $4.01. (a) How much longer does it take to make the trip by boat? (b) How much less is the cost of the train ticket? (c) How much less to the nearest per cent?

7. The price of a round-trip railroad ticket between Newport and Houston is $12.85. What is the average cost, to the nearest tenth of a cent, of transportation per mile for the round trip if the distance between Newport and Houston is 241 miles?

Problems for Application and Review

Group A

1. (a) 98 is what part greater than 56? (b) $1.05 is $\frac{2}{5}$ larger than what amount? (c) What amount is $\frac{1}{3}\%$ of $435? (d) Find the interest on $735.50 for 22 days @ $4\frac{1}{2}\%$.

2. A round-trip railroad ticket between Westport and Fairfield costs $19.12. The distance between Westport and Fairfield is 382.6 miles. What is the average cost, to the nearest tenth of a cent, of transportation per mile for the round trip?

3. If a car is driven 21 miles in 45 minutes, what is its average speed in miles per hour?

4. A savings bond bought today for $18.75 will be worth $25 when it matures in $9\frac{2}{3}$ years. How much must we invest in these bonds today in order that their maturity value shall be $1,500?

5. Eugene Temple invested $18,000 in 3%, $1,000 bonds that he purchased at $119\frac{3}{4}$ plus a brokerage fee of $2.50 per bond. (a) What is his annual income from the bonds? (b) What rate of income does he obtain on the investment?

Group B

1. (a) 396 is what part greater than 297? (b) Find the interest at 6% on $461.52 for 82 days. (c) Divide $4,093.10 by $305,000. (d) $6.60 is $33\frac{1}{3}\%$ more than what amount?

2. A round-trip railroad ticket between Walton and Eastland costs $27.98. If the distance between Walton and Eastland is 412.5 miles, what is the average cost, to the nearest tenth of a cent, of transportation per mile for the round trip?

3. Before buying an automobile costing $1,825, a man estimates his first year's expenditures as follows: license plates, $21.50; insurance, $62.30; gasoline and oil, $140; interest at 6% on cost of car; repairs, $75; depreciation, 40% of cost of car. Find the cost of operating the car the first year.

4. A man bought an automobile for $1,690. Five years later he was allowed $450 for it toward the purchase of a new car. What was the average annual depreciation?

5. Middleton drives his car 18 miles in 27 minutes. What is his speed in miles per hour?

Section 4 . . . Parcel Post, Express, and Freight

Methods of Transporting Goods. The method by which a person ships an article depends upon the speed required in delivery, the size and weight of the article, and the cost of the service. If he desires to send a small package a short distance, he will probably use parcel post because this service is rapid and inexpensive. Larger packages going longer distances may be sent by parcel post or express, depending upon the cost, the speed of delivery, and convenience. A very large shipment probably would be sent by freight which, although usually slower, is less expensive than either parcel post or express.

Parcel Post. Rates on parcel-post shipments vary with the distance and weight. Distance is judged according to the zone in which the point of delivery is located. Shipments to be delivered within the same city are classified under the "local" zone. The

WEIGHT IN POUNDS	LOCAL	ZONES						
		1-2 Up to 150 miles	3 150 to 300 miles	4 300 to 600 miles	5 600 to 1,000 miles	6 1,000 to 1,400 miles	7 1,400 to 1,800 miles	8 Over 1,800 miles
1.......	$0.15	$0.17	$0.17	$0.19	$0.21	$0.23	$0.25	$0.27
2.......	.17	.20	.21	.24	.28	.33	.37	.41
3.......	.18	.22	.24	.29	.35	.42	.48	.55
4.......	.19	.25	.28	.34	.42	.51	.60	.69
5.......	.20	.27	.31	.38	.48	.60	.71	.83
6.......	.22	29	.35	.43	.55	.70	.83	.97
7.......	.23	.32	.38	.48	.62	.79	.94	1.11
8.......	.24	.34	.42	.53	.69	.88	1.06	1.25
9.......	.25	.37	.45	.57	.75	.97	1.17	1.39
10......	.27	.39	.49	.62	.82	1.07	1.29	1.53
11......	.28	.41	.52	.67	.89	1.16	1.40	1.67
12......	.29	.44	.56	.72	.96	1.25	1.52	1.81
13......	.30	.46	.59	.76	1.02	1.34	1.63	1.95
14......	.32	.49	.63	.81	1.09	1.44	1.75	2.09
15......	.33	.51	.66	.86	1.16	1.53	1.86	2.23
16......	.34	.53	.70	.91	1.23	1.62	1.98	2.37
17......	.35	.56	.73	.95	1.29	1.71	2.09	2.51
18......	.37	.58	.77	1.00	1.36	1.81	2.21	2.65

Table of Parcel-Post Rates

remainder of the United States is divided into eight parcel-post zones, based upon distance from the place of mailing. The table given on page 270 shows the rates for all zones on parcel-post packages up to 18 pounds in weight. Any fraction of a pound is considered as a full pound.

A parcel-post package may be insured. The shipper pays an insurance fee based upon the value placed on the package. The fee schedule is shown in the table at the right.

For an additional fee of 7 cents, the shipper may obtain a return receipt from the person to whom an insured parcel-post package is sent if the package is insured for more than $5.

Schedule of Insurance Fees

Insurance	Fee
Up to $5	5¢
$5.01 to 10	10¢
10.01 to 25	15¢
25.01 to 50	20¢
50.01 to 100	30¢
100.01 to 200	35¢

Exercise 8. (*Oral*)

1. Using the table of parcel-post rates on page 270, state the cost of sending each of the following packages by parcel post.

a. A 6-pound parcel to the third zone
b. A 5-pound parcel to the seventh zone
c. A 10-pound parcel to the fifth zone
d. A 4-pound parcel to the eighth zone
e. A $3\frac{1}{2}$-pound parcel to the eighth zone
f. A $7\frac{3}{4}$-pound parcel to the fourth zone
g. A parcel weighing 8 lb. 14 oz. to the second zone
h. A parcel weighing 6 lb. 2 oz. to the first zone
i. A 13-pound parcel to a city 810 miles away
j. A $15\frac{1}{2}$-pound parcel to a city 275 miles away

2. Using the schedule of insurance fees shown above, state the cost of insuring a parcel-post package valued at (a) $5; (b) $50; (c) $25; (d) $2; (e) $12; (f) $125; (g) $35.

Express. Express companies publish schedules showing rates to all places to which they provide express services. These schedules generally show the rates for shipments of various weights, in multiples of 1 pound, from 1 pound to 100 pounds. Any fraction of a pound is considered as a full pound.

In the case of a shipment weighing over 100 pounds, the 100-pound rate is applied to the weight of the shipment. For example, at the scheduled rate of $16.64 per 100 pounds, the charge for a

138-pound shipment from Los Angeles, California, to Albany, New York, would be $22.96, computed as follows:

$$138 \div 100 = 1.38$$
$$\$16.64 \times 1.38 = \$22.9632, \text{ or } \$22.96$$

The scheduled rates are exclusive of a 3% Federal tax on the amount of the express charge. The total cost of making the shipment referred to above would be computed as follows:

Express charge	$22.96	
Federal tax	.69	(3% of $22.96)
Total shipping cost	$23.65	

Express companies insure packages up to $50 in value without extra charge. A person may insure any value above $50 by paying an extra charge of 15¢ for each additional $100. A fraction of an additional $100 is charged as a full $100.

Air Express. Express companies now also have air express divisions to handle packages requiring very prompt delivery. Although rates are rather high, the number of packages being sent by air express is rapidly increasing.

Freight. Freight rates are usually based on 100 pounds; the rate on fractional parts of 100 pounds is calculated on a proportionate basis. Thus, if the freight rate on a 248-pound shipment is $1.80 per 100 pounds, the freight charge on the shipment would be $4.46, computed as follows:

$$248 \div 100 = 2.48$$
$$2.48 \times \$1.80 = \$4.464, \text{ or } \$4.46$$

Freight shipments are subject to the 3% Federal tax, in the same manner as shipments by express. The computation of the total shipping cost of the shipment referred to above, to include the 3% tax, would be:

Freight charge	$4.46	
Federal tax	.13	(3% of $4.46)
Total shipping cost	$4.59	

As in the case of parcel-post and express shipments, any fraction of a pound in a freight shipment is considered as a full pound.

Exercise 9. (Written)

1. Gordon Nichols sends a 12-pound parcel-post package from New Orleans, Louisiana, to Atlanta, Georgia, which is 495 miles away. He insures the package for $150 and asks for a return receipt. What is the cost of making the shipment?

2. Stephen York, living in Portland, Maine, sends to his son Jack an 18-pound parcel-post package. His son lives in Jacksonville, Florida. The distance from Portland to Jacksonville is 1,323 miles. If Mr. York insures the shipment for $50, what is the cost of sending the package?

3. A clerk at the parcel-post window in the post office had to weigh 4 packages to be sent to the fourth zone and determine the postage on them. Each package weighed 3 lb. 12 oz. and was to be insured for $15. Find the total amount required to mail and insure the packages.

4. Parker Baker, a farmer, ships by express 139 pounds of dressed turkeys to Washington, D. C. The scheduled rate is $2.44 a hundred pounds. (a) What is the express charge, exclusive of the Federal tax? (b) If there is a Federal tax of 3% on the amount of the express charge, what is the total shipping cost?

5. M. B. Rich sends an 85-pound express shipment of clothing, valued at $575, from Cleveland to San Francisco, and insures it for full value. If the express company insures the shipment up to $50 in value without charge, but charges an insurance fee of 15¢ for each additional $100 of value, or fraction thereof, what is the total insurance charge on the shipment?

6. (a) Find the express charge on a 124-pound shipment by air express to Topeka, Kansas, if the rate is $16.60 a hundred pounds. (b) Find the total shipping cost if there is a Federal tax of 3% in addition to the express charge.

7. The freight rate between Seattle and Salt Lake City on a certain class of goods is $3.35 per 100 pounds. (a) What would be the total freight charge on a shipment consisting of 3 barrels weighing 195 pounds each, and 2 cases weighing 160 pounds each? (b) What would be the total shipping cost if there is a Federal tax of 3% in addition to the freight charge?

8. The freight rate for groceries by motor transport between two cities is $1.28 a hundred pounds. What would be the shipping charge on a 246-pound shipment, exclusive of the Federal tax?

9. Between two cities on the Atlantic Coast, a railroad freight shipment may be made at the rate of $3.74 for each 100 pounds. The shipment may be made by boat at the rate of $2.76 for each 100 pounds. If Carl Gibson desires to make a 245-pound shipment between these cities, how much will he save by making the shipment by water? (Disregard the Federal tax.)

Problems for Application and Review

1. (a) $6.58 is what per cent greater than $2.80? (b) $4.80 is $62\frac{1}{2}\%$ of what amount? (c) Find the number of days from June 2 to August 28. (d) Find the interest on $842.60 at 6% for 75 days.

2. A clerk in the post office had to weigh 5 packages to be sent to the 4th zone and determine the postage on them. Each package weighed 2 lb. 4 oz. and was to be insured for $5. Using the schedules of rates and fees on pages 270 and 271, find the total amount required to mail and insure the 5 packages.

3. The freight rate between Dallas and Sacramento on a certain class of goods is $2.85 per 100 pounds. What would be the total freight charges on a shipment of goods, of the foregoing class, consisting of 4 barrels weighing 375 pounds each and 3 cartons weighing 180 pounds each. (Disregard the Federal tax.)

4. A man bought an automobile for $2,380 and used it for $6\frac{1}{2}$ years. He then was allowed $495 for it toward the purchase of a new car. What was the yearly amount of depreciation?

5. A speed of twenty-one miles in thirty-six minutes is equivalent to how many miles an hour?

Cumulative Review

1. On May 1, James Gray received from the bank his monthly statement together with the canceled checks. According to the statement the bank balance was $674.13. On the same day the checkbook balance was $383.44. When comparing the canceled checks and the statement with the checkbook, Gray found that a check for $4.62 had not been entered in the checkbook, a check for $78.90 had been entered on the stub as $87.90, a deposit of $50 had not been entered, and the following checks were outstanding: $96.24; $50.72; $89.35. Prepare a reconciliation statement.

2. A man is getting $1.65 an hour for working a 40-hour week. How much must he get an hour to secure the same wage if the working week is reduced to $37\frac{1}{2}$ hours?

3. A certain wholesale house pays its salesmen a monthly salary of $250 and commission on sales each month as follows: 5% on all sales up to and including $2,000 and 8% on all sales above that amount. Hawkins, one of the salesmen, sold goods amounting to $1,920 in May and $2,520 in June. Find the total amount of salary and commission Hawkins received for the two months.

4. What should be the owner's asking price for a house and lot in order that he may realize $14,250 on the sale after reducing the price $400 and paying the real estate agent a 5% commission?

5. Carter held a 4½% mortgage for $6,500 on the property of the Renfrew Company. The mortgage was dated March 1, 1952, with the interest payable semiannually. A notation of the following payments appeared on the bond that was attached to the mortgage:

September 1, 1952; interest due and $500 on the principal
March 1, 1953; interest due
September 1, 1953; interest due and $1,500 on the principal

(a) If no additional payments were made, what amount was required to pay the mortgage in full on March 1, 1954? (b) What was the total amount of interest paid for the use of the money?

6. You wish to borrow $300 on a note and pay it back in installments of $75 each month on the principal. The total interest and other charges made by a bank for this loan will be $5.75. A loan company will charge 3% a month on that part of the loan which does not exceed $150 and 2½% a month on that part of the loan which exceeds $150. (a) Find the total interest cost that would be charged by the loan company. (b) From which concern would it be better to borrow? (c) How much better?

7. The cash price of a used automobile is $1,260. The deferred-payment plan requires a down payment of $420 and 12 monthly payments of $75.60 each. (a) What per cent of the unpaid balance on the car is added for carrying charges? (b) Wheeler has sufficient cash for the down payment and can borrow the balance at 5% for one year. How much cheaper is this plan than the deferred-payment plan?

8. On April 1, 1953, Brown deposited $500 in his savings bank. The interest rate is 2½% per annum, and the bank adds the interest to the depositors' accounts on April 1 and October 1 of each year. On April 1, 1954, Brown had to pay the semiannual interest at the rate of 5% per annum on a $3,500 mortgage on his home. He withdrew the necessary amount from his savings account to make this payment. (a) How much did Brown have on deposit in the savings bank on April 1, 1954, before making the withdrawal? (b) What was his bank balance after the withdrawal?

9. What amount must be invested in Wayne Steel 5% bonds at 95 in order to produce an annual income of $600?

10. What rate of income, to the nearest tenth per cent, does C. J. Rogers receive on an investment in 200 shares of Huron Company stock that he purchased at $35\frac{3}{8}$, plus brokerage at the rate of $28.19 per 100 shares, if the stock pays dividends of 50¢ per share quarterly?

11. The purchase price of a certain property was $15,000. The insurance cost $81.60 for 3 years, repairs $170 a year, depreciation amounted to $500 a year, and taxes $216.25 a year. At what price per month must the property rent to net the owner 8% on his investment?

12. H. V. Crounse purchased a plot of land for $1,500. In addition, he paid $85 for legal fees in connection with the purchase of the land. He contracted with the Home Construction Company for the erection of a cottage on a cost-plus-10% basis. The materials cost $10,435 and the labor $8,375. He engaged a landscape gardener and paid him $350 for landscaping. What was the total cost to Mr. Crounse?

13. The tax rate in Georgetown is 27.5 mills per dollar of assessed valuation. Find the tax to be paid on property assessed at $6,450.

14. A house valued at $7,500 was insured for $5,000. The policy contained an 80% coinsurance clause. The owner paid a premium of 65¢ per $100 for 3 years. (a) What was the average annual cost of the policy? (b) A fire caused a loss of $4,200. How much did the insurance company pay?

15. The semiannual rates for water in a certain city are as follows: 25¢ per 100 cubic feet for the first 5,000 cubic feet or less; 20¢ per 100 cubic feet for the next 5,000 cubic feet or less; 15¢ per 100 cubic feet for the next 5,000 cubic feet or less. Find the amount of Mr. Anderson's water tax if his meter showed 12,200 cubic feet used and if he took advantage of the 20% discount allowed for payment within 30 days.

16. The cost of electricity in a certain city is as follows: 5¢ per kilowatt-hour for the first 20 kilowatt-hours, 4¢ per kilowatt-hour for the next 40, 3¢ per kilowatt-hour for the next 140, and 2¢ for each additional kilowatt-hour. On May 10 a meter read 15,700 kilowatt-hours, and on June 10 it read 16,125 kilowatt-hours. Find the amount of the bill for electricity.

17. A consumer's gas meter read 68,700 cu. ft. on December 15 and 73,600 cu. ft. on January 15. Find the amount of his gas bill if the rate is $1.40 per thousand cu. ft.

UNIT IX

TAXES

Section 1 . . . Property Tax

Local Taxes. The money needed to pay the public expenses of local governments is derived chiefly from the *property tax.* The property tax is also used to provide most of the money needed by county governments and a considerable part of the funds required by some states.

Ascertaining the Amount to Be Raised by Property Tax. Each local tax district makes a detailed estimate of its expenditures for the coming year. This estimate is called a *budget.*

An estimate is also made of the miscellaneous income that will be received from sources other than the property tax, such as license fees, permits, fines, and other special sources of income.

The difference between the total budget and the total miscellaneous receipts is the amount that must be raised by the property tax. Thus, if the total budget of the town of Roxbury is $140,000 and the estimated miscellaneous receipts are $20,000, the amount to be raised by the property tax is $120,000.

Total budget	$140,000
Estimated miscellaneous receipts	20,000
Amount to raise by property tax	$120,000

The Assessment Roll. In order that the property tax may be apportioned equitably among the property owners, a valuation is placed by the assessors on all the property in the district. The assessors then prepare an assessment roll showing the assessed valuation of each piece of property and the total assessed valuation of all the taxable property in the district. For example, the assessment roll of Roxbury shows that the total assessed valuation of all taxable property in the town is $2,000,000.

Computing the Tax Rate. The tax rate is a decimal fraction that expresses the relationship of the amount to be raised by the property tax to the total assessed valuation. It answers the question: The total tax to be collected from the property owners is what part of the total assessed valuation?

The total tax therefore represents the part; and the total assessed valuation represents the base, or whole, with which the part is compared. Hence the formula:

$$\textbf{Tax Rate} = \frac{\textbf{Total Tax}}{\textbf{Total Assessed Valuation}}$$

Thus, in the town of Roxbury, where the total property tax is $120,000 and the total assessed valuation is $2,000,000, the tax rate is found to be .06, computed as follows:

$$\text{Tax Rate} = \frac{\$120{,}000}{\$2{,}000{,}000} = .06$$

In other words, the total tax is .06 of the total assessed valuation.

Exercise 1. (*Written*)

1. Find the decimal that expresses the tax rate in each of the following:

	ASSESSED VALUATION	TOTAL TAX		ASSESSED VALUATION	TOTAL TAX
a.	$2,000,000	$ 50,000	*d.*	$2,800,000	$25,200
b.	$6,000,000	$186,000	*e.*	$4,750,000	$76,000
c.	$4,500,000	$126,000	*f.*	$3,880,000	$83,420

2. In the town of Bedford the budget for the coming year is $448,650. Miscellaneous income is estimated at $62,950. The balance is to be raised by a property tax on a total assessment roll of $9,000,000. Find the tax rate, correct to five decimal places.

3. The taxable property in a city is assessed at $32,000,000. The total amount necessary to meet the general expenses of the city for the coming year is $2,148,191. The estimated amount of receipts from various miscellaneous sources is $368,121. Find the tax rate, correct to the nearest hundred-thousandth.

Apportioning the Total Property Tax Among the Property Owners. For the town of Roxbury, referred to on this page, the tax rate was found to be .06; that is, the total tax to be collected from the property owners is .06 of the total assessed valuation. Each property owner will therefore be required to pay a tax equal to .06 of the assessed valuation of his property. If James Dixon, for example, owns property assessed at $20,000, the tax he must pay is .06 of $20,000, or $1,200.

$$.06 \times \$20,000 = \$1,200$$

Exercise 2. (*Written*)

1. The assessed valuation of the taxable property in the village of Weston is $12,000,000. The total amount necessary to meet the expenses of the village government for the coming year is $644,525. Of this amount, it is estimated that $81,500 will be received from special licenses, fees, and other miscellaneous sources. (a) Find the tax rate. (Carry the decimal correct to five places.) (b) What tax should Mr. Warren pay if his property is assessed at $9,500?

2. The taxable property of a certain school district is assessed at $7,500,000. The total budget necessary to maintain the schools for the coming year is $299,800. Part of this expense will be met by money received from the state and from tuition fees, both of which are estimated at $131,200. (a) Find the tax rate, correct to the nearest hundred-thousandth. (b) How much tax should Mr. Bell pay whose property is assessed at $7,200?

3. The assessed valuation of the taxable property in a certain village is $12,200,000. The total amount necessary to meet the expenses of the village government for the coming year is $626,400. It is estimated that $7,200 will be received from special licenses and $121,700 will be received from the state for school purposes. (a) Find the tax rate. (Carry the decimal correct to five places.) (b) What tax should Mr. Roberts pay on property assessed at $8,500?

Converting a Decimal Rate to an Equivalent Rate per $1, $100, or $1,000, or as a Rate Per Cent. The tax rate obtained by dividing the total property tax by the total assessed valuation is a decimal and is referred to as the *decimal rate.*

It is common practice in many tax districts, however, to convert the decimal rate to an equivalent rate expressed in terms of *mills* or *cents* for each $1 unit of assessed valuation, or in terms of *dollars* for each $100 or $1,000 unit. The method of converting the decimal rate is illustrated by the following examples in which the decimal rate is assumed to be .04864:

The rate in *mills per $1* is .04864 × 1,000, or 48.64 mills.
The rate in *cents per $1* is .04864 × 100, or 4.864 cents.
The rate in *dollars per $100* is .04864 × 100, or $4.864.
The rate in *dollars per $1,000* is .04864 × 1,000, or $48.64.

Expressed as a *rate per cent*, the rate equivalent to .04864 is 4.864%.

Exercise 3. (Written)

1. For each of the following decimal rates, write the equivalent rate in terms of (1) dollars per $1, (2) cents per $1, (3) mills per $1, (4) dollars per $100, (5) dollars per $1,000, and (6) a per cent.

a. .04164
b. .05052
c. .03875
d. .05033
e. .00912
f. .00825
g. .00709
h. .03824

2. The assessed valuation of property in a certain village is $3,420,000. The total amount needed to meet the budget for the coming year is $152,400. (a) Find the tax rate, correct to the nearest hundred-thousandth. (b) Express your answer to (a) as a tax rate in mills per dollar.

3. The property in a certain city is assessed for $18,200,000. The estimated budget expenses are $1,336,500. Expected receipts are $192,500 from the state and $402,000 from license fees. Find the tax rate per $1,000. (Give your answer correct to the nearest cent.)

Problems for Application and Review

Group A

1. (a) 315 is what part greater than 280? (b) $2.10 is $\frac{2}{7}$ of what amount? (c) Express $\frac{2}{3}$% as a decimal. (d) Sixteen is what per cent of $5\frac{1}{3}$? (e) Find the interest at 5% on $694.30 for 21 days. (f) Divide 9,880 by 760,000.

2. In one county the total expense budget for last year was $607,405. Miscellaneous income was $124,200. The balance was raised by a property tax on a total assessment roll of $43,680,000. (a) Find the tax rate. Carry the decimal correct to five places. (b) What was Mr. Martin's tax if his property was assessed at $5,600?

3. At 40 miles per hour, how many minutes will it take to drive 18 miles?

4. Morton is considering buying a house that has been renting for $80 a month, with the following annual expenses: taxes, $173;

repairs and depreciation, $320; insurance, $17. Assuming that the rent income and the expenses remain the same, how much can Morton afford to pay for the house so that he may earn 6% on his investment?

5. On March 15, C. J. Gaynor purchased 30 shares of stock at $27\frac{3}{8}$, for which the broker charged $11.89 commission for buying and $1.80 for taxes. Gaynor held the stock until October 1, when he sold it at $31\frac{7}{8}$ and paid $13.10 commission for selling and $3.02 for taxes. During the time that Gaynor held the stock he received two dividends of $17\frac{1}{2}$¢ each per share. (a) For how much did the broker bill Gaynor when the stock was purchased? (b) How much did Gaynor receive from the broker who sold the stock? (c) What was Gaynor's total gain on the entire transaction?

Group B

1. (a) Express a tax rate of .00963 as a rate per $1,000. (b) 225 is what part smaller than 270? (c) $3.45 is $\frac{2}{5}$ smaller than what amount? (d) What amount is $\frac{2}{3}$% of $465? (e) Find the interest at 6% on $472.50 for 81 days.

2. The assessed valuation of taxable property in a certain school district is $9,446,190. The gross cost of operating the schools amounts to $500,669.21. The school district's income from state moneys and nonresident tuition fees is $226,623.97. (a) Find the tax rate. Carry the decimal to five places. (b) Express your answer to (*a*) as the tax rate per $1,000. (c) Find the amount of John Smith's school tax if his property is valued at $12,000 and is assessed at 75% of its value.

3. How many minutes will it take Mr. Bartley to drive 21 miles at the rate of 35 miles an hour?

4. What monthly rental must be charged for a house costing $8,500 to realize a net income of 6% on the original investment if taxes are $240.50, repairs and depreciation, $340, and insurance $25.50?

5. Leslie Goff owned 200 shares of Eastern Electric stock. He ordered his broker to sell the stock at $102\frac{1}{2}$ and buy $1,000 Superior Paper Company bonds at 98. The total commission and taxes amounted to $92.91 on the sale of the stock. The commission for buying the bonds was $2.50 per bond. (a) What were the net proceeds from the sale of the stock? (b) How many bonds were purchased? (c) What unexpended balance was left to Goff's credit?

Section 2 . . . Sales Tax

Use of Sales Tax. Many cities and states now levy a retail sales tax. The tax is usually collected from the purchaser by the merchant, who passes it on to the proper tax official.

Computing the Sales Tax. Shown below is the tax schedule used in a state that levies a 3% sales tax.

AMOUNT OF SALE	TAX
1¢ to 40¢	None
41¢ to 70¢	2¢
71¢ to $1	3¢
More than $1 (whole dollars)	3¢ on each dollar

AMOUNT IN EXCESS OF WHOLE DOLLARS	TAX
1¢ to 8¢	None
9¢ to 40¢	1¢
41¢ to 70¢	2¢
71¢ to 99¢	3¢

When the sale exceeds a whole number of dollars, the tax on the excess is determined by using the table of rates at the right.

Example: Using the sales tax schedule shown above, compute the amount of tax that a shoe dealer should charge on the sale of a pair of shoes priced at $9.25.

Solution and Explanation

The tax on a sale amounting to $9.25 consists of the tax on $9.00 plus the tax on $.25.

Tax on $9.00 (9 × tax on $1, or 9 × 3¢)	*27¢*
Tax on $ .25 (per schedule—9¢ to 40¢)	*1¢*
Tax on $9.25	*28¢*

Exercise 4. (*Oral*)

Using the schedule shown above, state the amount of the sales tax on each of the following sales.

	AMOUNT OF SALE	TAX		AMOUNT OF SALE	TAX		AMOUNT OF SALE	TAX
1.	$ .36	?	4.	$ .82	?	7.	$1.67	?
2.	$1.36	?	5.	$2.82	?	8.	$3.25	?
3.	$2.36	?	6.	$ .67	?	9.	$5.50	?

Exercise 5. (Written)

In the following problems, use the schedule shown on page 282 for determining the amount of the sales tax.

1. John Brown purchases articles at Carroll's Drug Store priced as follows: a comb, 38¢; a tube of tooth paste, 50¢; a tube of shaving cream, 65¢; and a bottle of shaving lotion, 50¢. (a) What is the total amount of his purchase? (b) How much sales tax must he pay on this amount? (c) What is the gross cost of the purchase?

2. Mrs. Margaret Flournoy, resident of a small town, makes the following purchases in a general store: 50 lb. potatoes at 7¢, 6 lb. string beans at 15¢, 2 pairs stockings at 98¢, one sweater at $5.45, and one belt at 95¢. Mrs. Flournoy's state levies a sales tax on retail sales of all commodities except groceries and other food products. Find (a) the tax she must pay on the purchase and (b) the gross cost of the purchase.

3. At the Grey Shoppe, Lucille Avery buys a hat, $5.25; a coat, $25.75; a dress, $10.69; and a belt, $1.00. (a) What sales tax does she pay on the purchase? (b) What is the gross cost of the purchase?

4. On Saturday afternoon Russell Hardy makes the following five purchases, each at a different store:

ITEM PURCHASED	NET COST	SALES TAX	GROSS COST
a. Box of Candy	$ 1.25	?	?
b. Sports Coat	27.50	?	?
c. Three Shirts	8.85	?	?
d. Pair of Gloves	2.10	?	?
e. Golf Club	9.45	?	?
Total	?	?	?

(a) Find the sales tax on each purchase. (b) What is the gross cost of each purchase? (c) Find the total net cost of all items purchased. (d) Find the total sales tax. (e) What is the total gross cost of all items purchased?

Problems for Application and Review

Group A

1. (a) Express a tax rate of 42 mills on $1 as a rate on $1,000. (b) $3.90 is $\frac{2}{3}$ greater than what amount? (c) Find $\frac{1}{6}\%$ of $4,950. (d) What amount is 125% greater than $25? (e) Find the interest at 6% on $801.15 for 32 days.

2. At the Regal Clothes Shop, Walter Reed purchases a suit, $52.75; a hat, $8; a pair of shoes, $12.90; and a belt, $1.50. (a) Using the tax schedule on page 282, determine the amount of the sales tax on the purchase. (b) What is the gross cost of the purchase?

3. The assessed valuation of taxable property in a certain city is $63,143,639. The total amount necessary to meet the general expenses of the city for the coming year is $2,896,191.06. The estimated amount of receipts from various sources is $736,242.41. (a) Find the tax rate, carrying the decimal to five places. (b) What would be H. B. Grove's tax if his property is valued at $16,000 and is assessed at 70% of its value?

4. At 28 miles an hour, how many hours will it take to drive 175 miles? (Express the answer as a mixed number.)

5. A savings bond costing $75 is worth $100 at the end of 9 years 8 months. (a) What is the total income from the investment over the entire period? (b) What is the average annual income? (c) The average annual income is equivalent to what rate of income on the investment, to the nearest tenth per cent?

Group B

1. (a) Express a tax rate of 31 mills on $1 as a rate on $1,000. (b) 175 is what part greater than 105? (c) What amount is $\frac{5}{6}$% of $5,250? (d) $7.50 is 33$\frac{1}{3}$% less than what amount? (e) Find the interest on $518.50 for 92 days at 6%.

2. (a) Using the tax schedule on page 282, find the sales tax on a purchase consisting of a dress, $29.45; a coat, $38.50; and a hat, $7.98. (b) What is the gross cost of the purchase?

3. At 27 miles an hour, how many hours and minutes will it take to drive 180 miles?

4. Standard Cement Corporation 4$\frac{1}{4}$% bonds with a par value of $1,000 may be purchased at 95$\frac{1}{2}$ plus a brokerage fee of $2.50 per bond. (a) How many bonds must Paul Carroll purchase in order to obtain an annual income of $1,700? (b) What will be the amount of his investment in the bonds?

5. What is the rate of income on a $500 bond, bearing interest at 3%, if it is purchased for $400?

6. If a salesman is paid $250 a month and a commission of $\frac{5}{8}$% on all sales in excess of $25,000 in any single month, what must be the amount of his sales each month in order that his total monthly earnings may be $475?

Section 3 . . . Old-Age Benefit Tax

Old-Age Benefits. The Social Security Act, as amended in 1950, provides for the payment of old-age insurance benefits, or pensions. Funds for the payment of these benefits are provided by taxes levied upon employees and their employers, and upon self-employed persons.

Tax on Employee. Under the terms of the Act, the employer is required to deduct a certain percentage of the employee's wages on each pay day and, at regular intervals, remit the amounts deducted to the Federal Government. An employee who is paid more than $3,600 in a calendar year is taxed on the first $3,600 only.

The term "wages," as used in the Act, means compensation of any kind. Thus it includes salaries, fees, bonuses, and commissions, as well as pay by the hour, day, or week, or by the piece.

Example: Flora Stevens, a salesclerk in the Anne Lewis Shop, is paid $35.00 per week, plus 4% commission on sales in excess of $500. During the last week of March her total sales amounted to $780. Assuming that the old-age benefits tax rate was $1\frac{1}{2}\%$, what amount of tax was deducted from her earnings for the week?

Solution:

Stated Salary = $35.00
Commission = 11.20 (4% of $280)
Total earnings = $46.20
$1\frac{1}{2}\%$ of $46.20 = $.693, or $.69
Amount of tax deducted = $.69. Ans.

Tax on Employer. A tax equal to that paid by the employee is levied on the employer. The tax is computed at the same rate as the employee's tax and is based on the total taxable wages paid by the employer.

For example, if the taxable wages paid by the owner of the Joyce Ryan Shop during the month of March total $2,187.85, and the tax rate is $1\frac{1}{2}\%$, the tax the owner must pay is $32.82.

$2,187.85 × .015 = $32.81775, or $32.82

Tax on Self-Employed Person. The self-employment tax is imposed on the first $3,600 of annual net earnings from self-employment. The rate is 1½ times the rate paid by wage earners. Thus, if the rate paid by wage earners is 1½%, the rate paid by a self-employed person is 1½% × 1½, or 2¼%. The tax is payable once a year.

Exercise 6. (*Written*)

1. The regular factory hours of the Kenwood Mills are eight hours a day for a five-day week (Monday through Friday) with time and a half for overtime. During the week ended June 30, Glenn Harmon worked 7 hours on Monday, 10 hours on Tuesday, 8 hours on Wednesday, 10½ hours on Thursday, and 8 hours on Friday. (a) If Harmon received $1.55 an hour as his regular wage, what was the amount of his total earnings for the week? (b) If the company deducted 1½% from Harmon's wages as his contribution to the old-age benefits fund, what was the amount of the deduction?

2. The Social Security Act requires the employer to contribute to the old-age benefits fund an amount equal to that contributed by the employees. If the wages paid by the Kenwood Mills during the quarter ended June 30 totaled $52,384.61, and the old-age benefits tax rate was 1½%, what amount was the company required to contribute to the fund?

3. Earl Kent, a factory worker who works on a piece-rate basis, completed the following number of pieces during the week ended January 28: Monday, 48; Tuesday, 60; Wednesday, 64; Thursday, 69; Friday, 62. (a) If the rate is 18¢ for each piece, what was the amount of his total earnings for the week? (b) What amount should be deducted for the social security tax if the tax rate is 1½%?

4. Fred Milner, a salesman, is paid a salary of $300 a month with a 7% commission on all sales over $4,000 a month. During the month of January his sales amounted to $6,375. (a) What was the amount of his total earnings for the month? (b) What amount was deducted for social security if the rate of tax was 1½%?

5. Jon Dow, whose income is derived from self-employment, had a self-employment net income of $3,372.69 last year. Find the amount of his self-employment tax if the rate was 2¼%.

Problems for Application and Review

Group A

1. (a) Express 13 mills as a decimal part of $1. (b) Find ⅓% of $7,350. (c) 161 is what per cent less than 175? (d) Find the interest on $565 for 28 days at 6%.

2. A worker is paid a regular wage of $1.70 an hour for eight hours a day from Monday through Friday with time and a half for overtime on those days and double time for work on Saturday and Sunday. During one week he worked nine hours each day, Monday through Sunday. (a) Find his total earnings for the week. (b) What amount should be deducted for social security if the tax rate is 1½%?

3. A. B. Henry owned 100 shares of Consolidated Electric stock. He authorized his broker to sell the stock at 125½ and buy Denver $1,000 bonds at 103. The brokerage and taxes on the sale of the stock amounted to $48.81, and the brokerage for buying the bonds was $2.50 per bond. (a) What were the proceeds from the sale of the stock? (b) How many bonds were purchased? (c) How much money was left to Henry's credit?

4. D. S. Dewire has an investment of $15,000 in 5¼% bonds, par value of each bond $1,000, which he purchased at 93¾, brokerage included. (a) What annual income does he receive from the investment? (b) What is the rate of income?

Group B

1. (a) Express 28 mills as a decimal part of $1. (b) 405 is what part smaller than 540? (c) What amount is ⅔% of $2,340? (d) Find the interest at 6% on $175 for 88 days.

2. The assessed valuation of taxable property in a certain village is $12,169,250. The total amount necessary to meet the expenses of the village for the coming year is $319,051.52. The estimated receipts from water works and other sources are $45,000. (a) Find the tax rate, correct to five decimal places. (b) What would be A. N. Watson's tax if his property is valued at $12,000 and is assessed at 85% of its value?

3. A savings bond costing $37.50 is worth $46 at the end of 7½ years. If Walter Brock purchases one of the bonds and redeems it at the end of 7½ years, what annual rate of income does he obtain on his investment, to the nearest tenth per cent?

4. When a radio is sold on the installment plan, the Ace Radio Shop adds a carrying charge of 10% to its $42.50 cash price. (a) What is the carrying charge? (b) If the required down payment is $7.75 and the amount remaining is to be paid in 12 monthly installments, what will be the amount of each monthly payment?

5. A man borrowed $350 for two years. The total cost of the interest was $49. What rate of interest did he pay?

Section 4 . . . Income Tax

Federal Income Tax. The principal source of income of the Federal Government is the tax that the government levies on the incomes of individuals and corporations. The individual income tax is based on the taxable income remaining after subtracting certain allowable deductions and exemptions from the individual's gross income.

Gross Income. *Gross income,* in general, includes income from wages, salaries, commissions, bonuses, tips, competitive prizes and awards, dividends, interest, rents, gain on sales of property, and profit from a business or profession.

Net Income. *Net income* is gross income minus certain allowable deductions. These deductions consist chiefly of contributions to charitable or religious organizations; interest paid on personal debts; state and local taxes; expenses relating to rents received for use of the taxpayer's property; losses on sales of stocks, bonds, and rental property; expenses in operating a business or carrying on a profession; and certain miscellaneous expenses connected with one's employment.

Exercise 7. (*Written*)

1. C. E. Coyle had for the year a gross income of $3,000 and claimed the following deductions: contributions to church and Community Chest, $125; interest on mortgage, $216; real estate taxes, $308; gasoline tax, $40; motor vehicle tax, $33. Find his net income for the year.

2. During one year, C. S. Cobb received the following income: salary, $5,600; interest on bank deposits, $75; interest on bonds, $80; dividends from stocks, $64. He claimed the following deductions: contributions, $200; real estate taxes, $350; interest on mortgage, $400; membership dues in professional associations, $25. Find his net income for the year.

3. Harry Rulison's income for one year consisted of the following: salary, $4,400; commissions, $345; bonus, $125; interest from bank deposits and bonds, $35; taxable profit on sale of stocks and bonds, $622. He claimed deductions as follows: interest on mortgage, $300; taxes, $342; contributions, $325. What was his net income for the year?

Net Income Subject to Tax. *Net income subject to tax,* sometimes referred to as *taxable net income,* is net income minus one or more exemptions. The amount of the exemption varies from time to time, being subject to change by act of Congress.

Exercise 8. (*Oral*)

Assume that the income tax law allows the taxpayer to deduct one $600 exemption for himself, one for his wife if he is married, and one for each dependent. State (a) how many exemptions may be deducted and (b) the net income subject to tax in the case of each taxpayer listed below.

Taxpayer	Exemption Status	Net Income
1. Ida Castle	Single	$2,700
2. Henry Haswell	Married	$5,450
3. James Ruso	Married, 2 dependent children	$6,200
4. Anna Miller	Single, dependent mother and sister	$3,750
5. Dana Bartley	Married, dependent father, and 3 dependent children	$4,400
6. Stanley Wells	Single, dependent father and mother, and 2 dependent children	$6,850

Income Tax Rates. The income tax is computed as a percentage of the taxable net income. The rates are graduated so that higher rates apply to higher incomes, as shown by the following tax rate schedule:

22.2%	on the first	$2,000
24.6%	on the next	$2,000
29.0%	on the next	$2,000, etc.

Exercise 9. (*Written*)

In solving the following problems, assume that the tax rate is 22.2% on the first $2,000 of net income subject to tax, 24.6% on the next $2,000, and 29.0% on the next $2,000.

1. Find the amount of income tax that must be paid by Louise Brown whose net income subject to tax is $2,280.

2. Alfred Stiles, owner of a neighborhood grocery store, has a taxable net income of $4,286. How much income tax must he pay?

3. Lorin Jones, a single man with three dependents, has a net income of $7,660 for the year. Assuming that $600 is allowed for each exemption, find (a) his taxable net income and (b) his income tax for the year.

4. A single man with two dependents has a gross income of $6,225 and deductible expenses amounting to $685. The law allows $600 for each exemption. Find (a) his net income, (b) his net income subject to tax, and (c) the amount of his income tax for the year.

5. A single man, with dependent father and mother, has a gross income of $5,500 and deductible expenses amounting to $682. The allowance for each exemption is $600. Find (a) his net income, (b) his net income subject to tax, and (c) his income tax.

Income Tax Withholding. Under the income tax laws, employers are required to withhold the estimated income tax from the current wages of their employees. The amounts withheld are remitted by the employers at regular intervals to the Federal Government.

The employer determines the amount to withhold by referring to withholding tables supplied by the government. These tables show the amount to be withheld from an employee's weekly, biweekly, semimonthly, or monthly wages.

At the end of the year, the employer must furnish each employee a tax-withholding statement showing the total wages earned during the year and the amount of tax withheld. The employee needs this information from the employer as he is required to report these amounts in his income tax return.

Exercise 10. (Written)

1. Roy Joslin earns $65 weekly. If his employer deducts $10.40 for withholding tax and 1½% for Federal old-age tax, how much does Joslin receive as "take-home" pay?

2. Last week an employee in a shoe factory worked 40 hours at $1.53 an hour. If $9.60 was deducted for withholding tax and 1½% for social security, what was the amount of his pay check?

3. During one week, Don Ellis worked 40 hours at $1.80 an hour and 8 hours at $2.70. Find the amount of his pay check if his employer deducted $13.50 for income tax, 1½% for social security, and $.97 for group insurance.

4. Ethel Tyler, in one week, worked 40 hours at $1.72 and 3 hours at $2.58. Her employer deducted $12.80 for income tax, 1½% for social security, $.79 for insurance, and $2.75 for savings bonds. What was the amount of her pay check for the week?

Income Tax Return. Tax withholding applies only to wages that the taxpayer receives from his employer. It does not apply to income received from other sources, such as rent, interest, dividends, profits on investments, etc. Also, the withholding tables are constructed on the assumption that similar wages are received in all the pay periods of the year, whereas the taxpayer may actually work and receive wages for only a part of the year.

For these reasons, the amounts withheld by the employer seldom exactly equal the taxpayer's actual tax liability. Therefore, at the end of the year, it is necessary for each taxpayer to file with the director of internal revenue an income tax return, containing all the data necessary for computing the actual tax liability, so that any additional amount due may be collected or any overpayment refunded.

"Split-Income" Method of Computing the Tax in a Joint Return of Husband and Wife. A joint return is a single return that includes the income, deductions, and exemptions of both husband and wife. The tax law provides a "split-income" method of computing the tax in a joint return.

Under this method, the tax is computed on one half of the taxable net income, and that result is multiplied by 2 to find the total tax. When the taxable net income exceeds $2,000, the total tax computed in this manner is less than if it had been computed on the income in one sum.

Even though one spouse had no income, a husband and wife can make a joint return so as to take advantage of the "split-income" provision.

Exercise 11. (*Written*)

In solving the following problems, compute the tax by the "split-income" method except where directed otherwise. Assume that the tax rate is 22.2% on the first $2,000 of income subject to tax, 24.6% on the next $2,000, and 29.0% on the next $2,000.

1. Compute the tax on the taxable net income represented by each of the following:

a. $2,400 *b.* $3,600 *c.* $4,800 *d.* $5,600 *e.* $6,400

2. Paul Rich had a taxable net income of $2,800 for the year. His wife had no income. They made a joint tax return, however, to take advantage of the "split-income" provision. (a) What was the amount of the tax? (b) What would the tax be if it were computed on the income in one sum? (c) How much did they save by making a joint return?

3. In a joint tax return, Mr. and Mrs. Daley reported a taxable net income of $3,500 for the year. They also reported total withholding taxes of $823.20 deducted from Mr. Daley's wages by his employer. (a) Find their actual tax liability. (b) Find the amount of their overpayment or balance of tax due.

4. Mr. and Mrs. Welch, in a joint tax return, reported a taxable net income of $5,800 for the year. (a) Find their actual tax liability. (b) What amount should they remit with their tax return to the director of internal revenue if their total tax payments during the year amounted to $1,281.60?

Special Rates for the Head of a Household. Under certain conditions, an unmarried taxpayer who maintains a home which he shares with a dependent or with an unmarried child, grandchild, or stepchild, even though such child is not a dependent, may qualify as the head of a household. If he does, the law provides special rates whereby he obtains 50 per cent of the benefits of income splitting enjoyed by married persons.

Exercise 12. (*Written*)

In solving the following problems, assume that the taxpayer qualifies as the head of a household and that the rates are 22.2% on the first $2,000 of taxable net income, 23.4% on the next $2,000, and 27.0% on the next $2,000. Assume also that $600 is allowed for each exemption.

1. In making out his income tax return, Eric Lantz finds that his taxable net income is $2,040. The tax-withholding statement from his employer shows that $434.40 of income taxes has been deducted from his wages. (a) What is his actual tax liability? (b) Find the amount of his overpayment or balance of tax due.

2. Larry Gage's income tax return shows that he had a gross income of $7,420 and allowable deductions of $930. He is a widower with two dependent children and is allowed $600 for each exemption. (a) Find the amount of his net income subject to tax. (b) Find his actual tax liability. (c) Find the amount of his overpayment or balance of tax due if his total income tax payments during the year amounted to $1,081.60.

3. Alan Niles submitted the following facts in his income tax return: salary, $5,460; interest and dividends received, $70. He claimed deductions as follows: taxes, $310; interest on mortgage, $215; contributions, $125. He is a single man with a dependent

mother and is allowed $600 for each exemption. (a) Find his actual tax liability. (b) Find the amount of his overpayment or balance of tax due if his total income tax payments for the year amounted to $852.80.

4. On March 3, Ivan Case, a single man with one dependent, reported the following facts in his Federal income tax return: salary, $4,800; interest received, $90; commissions and bonus, $100. Deductible expenses were: contributions, $50; interest paid, $245; taxes, $230; miscellaneous expenses, $25. Total income tax payments for the year, $725.60.

(a) Find his actual tax liability if $600 is allowed for each exemption. (b) Should he remit payment of balance due with his income tax return or should be request refund of overpayment? (c) How much?

State Income Tax. The income tax is also imposed by about two thirds of the states. The state income tax laws are patterned after the Federal law. The rates are different from the Federal rates and vary among the different states.

Problems for Application and Review

Group A

1. (a) Express a tax rate of 18½ mills on $1 as a rate on $1,000. (b) What amount is ⅔% of $495? (c) What per cent of $22.50 is $67.50? (d) $13.20 is 37½% more than what amount? (e) Find the interest at 6% on $325 for 39 days.

2. James Harvey, a widower with three dependent children, submitted the following facts on his income tax return: salary, $5,000; commissions, $400; bonus, $250; interest from bank deposits and bonds, $1,560; dividends from stock, $640. He claimed the following deductions: interest on mortgage, $400; taxes, $350; contributions for religious and charitable purposes, $500. Find the amount of his income tax, assuming that the income tax law allows $600 for each exemption and that the tax rate is 22.2% on the first $2,000 of taxable net income, 23.4% on the next $2,000, and 27.0% on the next $2,000.

3. A house is valued at $16,000 and its contents at $4,800. The house is insured for 80% of its value at a rate of 55¢ per $100 for three years and the contents for their full value at an annual rate of 32¢ per $100. (a) Find the premium paid for the insurance on the house. (b) Find the total annual cost of carrying both insurance policies.

4. Robert Darrow is considering the purchase of a house, which rents for $90 a month and which may be bought by giving a 5% mortgage for $6,000 and cash for the balance. Besides interest on the mortgage, he estimates that other expenses will amount to $585 annually. If he desires to realize 6% net income on his investment, what is the highest price he can offer for the property?

5. A savings bond costing $75 is worth $85 at the end of the fifth year. If Joan Weaver purchases one of the bonds and redeems it at the end of the fifth year, what annual rate of income, to the nearest tenth per cent, does she obtain on her investment?

Group B

1. (a) Express 8 mills as a decimal part of $1. (b) $8.75 is what part greater than $7? (c) $1.60 is $\frac{5}{4}$ of what amount? (d) $7.50 is what per cent greater than $3? (e) Find the interest on $245 for 99 days at 6%.

2. A. R. Rich, a widower with two dependent children, submitted the following facts on his income tax return: salary, $6,000; commissions, $925; interest on bank deposits and notes, $310; taxable profit from sale of stocks and bonds, $613. He claimed the following deductions: interest on mortgage, $325; taxes, $285; charitable contributions, $560. Find the amount of his income tax, assuming that the income tax law allows $600 for each exemption and that the tax rate is 22.2% on the first $2,000 of taxable income, 23.4% on the next $2,000, and 27.0% on the next $2,000.

3. Arnell's house, valued at $10,000, was insured for $7,500 at the 3-year rate of 65¢ per $100. The policy contains the standard 80% coinsurance clause. (a) What was the average annual cost of the insurance? (b) A fire caused a $3,200 loss to the house. What was the amount Arnell received from the insurance company?

4. Metzger can borrow $300 from his bank, repaying the loan in five monthly payments of $61.25 each. He can borrow the same amount from a credit union, of which he is a member, repaying the loan in five monthly payments of $60 each plus interest at $\frac{3}{4}$% per month on the unpaid balance. (a) How much interest would

Metzger pay the bank for the loan? (b) How much interest would he pay the credit union? (c) From which concern would it be better to borrow? (d) How much better?

5. Find (a) the due date and (b) the amount due at maturity on a 90-day note for $632.75, dated August 4, with interest at 5%.

Cumulative Review

1. On January 15, W. F. Watson's checkbook balance was $114.49. On the same date, the monthly statement from the bank showed a balance of $150.45. The following checks were outstanding: $8.25; $28.50; $16.17. A comparison of the statement with the checkbook showed that the following items, which were not recorded in the checkbook, had been paid: a canceled check for $6.40; a service charge of $1.56. The amount of one of the canceled checks was $121 while the amount on the checkbook stub was $112. Prepare a reconciliation statement.

2. The regular factory hours of the Milton Spinning Mills are eight hours a day for a five-day week (Monday through Friday). Time and a half is paid for all overtime each day. One week Wells worked as follows: Monday, 8 hours; Tuesday, 9 hours; Wednesday, 6 hours; Thursday, 10 hours; Friday, 8 hours; Saturday, 4 hours. If Wells received $1.68 an hour as his regular wage, and if $1\frac{1}{2}$% of his pay was deducted for social security and $13.60 for withholding tax, what was the amount of his pay check?

3. Mabel French wishes to realize $2,375 from the sale of her summer camp after allowing for a reduction of $250 from her asking price and for the real estate agent's commission of 5%. What should be her asking price for the property?

4. James Herber held a 6% mortgage for $3,500 on the residence of Ernest Hoit. The mortgage was dated April 1, 1952, with interest payable semiannually. The following payments were recorded on it:

October 1, 1952; interest due and $900 on the principal
April 1, 1953; interest due and $800 on the principal
October 1, 1953; interest due and $500 on the principal

(a) If no additional payments were made, what amount was required to pay the mortgage in full on April 1, 1954? (b) What was the total amount of interest paid for the use of the money?

5. A savings bank pays interest on its deposits at the rate of $2\frac{1}{2}$% a year and adds interest to the balance on the first of January, April, July, and October. Deposits made not later than the third business day of any month draw interest from the first of the month. Last year, on January 2, R. C. George deposited $800. On April 1, he withdrew $200. On July 1, he deposited $150. He closed his account on October 1. (a) How much did the bank pay Mr. George on October 1? (b) What was the amount of bank interest that he reported on his income tax return?

6. What amount must be invested in National Power Company 4% bonds at $112\frac{1}{4}$ in order to produce an annual income of $1,000?

7. Harvey Wilson purchased eight $1,000 railroad bonds, bearing 4% interest, at $840 each, brokerage $20, and 50 shares of Wiliston Electric stock at 32, brokerage and taxes $19.29. The stock is paying a quarterly dividend of $.50 a share. (a) Find the total cost of the stock and the bonds. (b) Find Wilson's annual income. (c) Find the rate of income, to the nearest tenth per cent, on Wilson's investment.

8. On April 10, Fred Judd purchased 30 shares of stock at $36\frac{3}{8}$, for which the broker charged $13.91 commission for buying and $1.80 for taxes. Judd held the stock until November 15, when he sold it at $34\frac{3}{4}$ and paid $13.69 commission for selling and $3.03 for taxes. During the time he held the stock he received three dividends of $37\frac{1}{2}$¢ each per share. What was Judd's net gain or loss on the entire transaction?

9. James Parker owned 60 shares of Northern Electric stock. He authorized his broker to sell the stock at $104\frac{1}{2}$ and buy Superior Steel $1,000 bonds at 93. The brokerage and taxes for selling the stock was $35.17. The brokerage for buying the bonds was $2.50 for each bond. (a) What amount was available for the purchase of the bonds? (b) How many bonds were purchased? (c) How much money was left to Parker's credit?

10. Mr. C. J. Rose purchased a house and lot costing $12,000. He paid $4,800 in cash and gave the seller a 6% mortgage for the remainder. He immediately rented the house to a tenant for $125 a month. Besides interest on the mortgage, he paid during the first year a $25 premium on a one-year fire insurance policy of $10,500, 3.6% tax on a valuation of $9,500, and $213 for repairs and miscellaneous expenses. Allowing $200 for depreciation, what rate of income did he realize on his investment?

11. George McKay is paying $125 a month rent for a one-family house. He can purchase the house for $14,000 by paying

\$4,000 cash and giving a mortgage at $4\frac{1}{2}\%$ for the remainder. The estimated annual expenses that he would have as an owner, in addition to interest on the mortgage, are: taxes, \$318; insurance, \$42; repairs and depreciation, \$500. If he can earn $2\frac{1}{2}\%$ on his money by investing it in government securities, will it be cheaper to buy or to rent, and how much cheaper per month?

12. The tax rate last year in Clarksdale was \$46.22 per \$1,000. The tax regulations provide that a discount of 1% is to be allowed on all tax bills paid between January 1 and January 10 and $\frac{1}{2}\%$ discount on tax bills paid between January 10 and March 1, but any bill not paid by April 1 is subject to an added penalty of $\frac{1}{2}\%$ for each month thereafter. (a) A. D. Fisher, who owned property assessed at \$14,500, paid his tax bill on February 11. What was the amount of his payment? (b) What was the total amount paid by F. E. Turner who owned property assessed at \$12,000 if he paid the tax bill on May 17?

13. The meter rate for filtered water in a certain city is 12 cents per 100 cubic feet for the first 20,000 cubic feet, 11 cents per 100 cubic feet for the next 30,000 cubic feet, and 9 cents per 100 cubic feet for all over 50,000 cubic feet. On January 3, the Western Laboratories received a bill for 58,000 cubic feet of filtered water. If 1% cash discount was allowed for paying the bill on or before February 2, what was the amount of the check sent in payment of the bill on February 1?

14. Wayne, a physician, bought a car for \$2,400. During the first year he drove the car 16,980 miles. His car expenses were: gasoline and oil, \$368; repairs and miscellaneous expenses, \$126; insurance, \$95; license plates, \$17; interest on the investment at 2%; depreciation at 30% of the cost of the car. (a) Find Wayne's total car expense for the year. (b) Find the cost per mile of operating Wayne's car, expressed to the nearest tenth of a cent.

15. L. C. Smith sent by parcel post to the 5th zone 5 packages weighing, respectively, 15 oz., 1 lb. 7 oz., 3 lb. 5 oz., 6 lb. 8 oz., and 7 lb. 9 oz. Using the schedule of rates on page 270, find the total parcel-post charges for the 5 packages.

16. The assessed valuation of property in a certain school district is \$1,680,500. The total amount necessary to meet the expenses for the coming year is \$58,741.52. The estimated receipts from various sources are \$16,500. (a) Find the tax rate. Carry the decimal to five places. (b) What should be H. C. Rogers' tax if his property is valued at \$16,000 and is assessed at 80% of its value?

UNIT X

PROBLEMS OF THE RETAILER

Section 1 . . . The Balance Sheet

Assets. Property of various kinds is essential for the operation of a business. A retail grocer, for example, must have a stock of groceries and other merchandise. He must also have wrapping materials, various items of store equipment, and a supply of cash for making change and paying expenses. These items of property which the proprietor owns and uses in his business operations are called the *assets* of the business.

Liabilities. A businessman often obtains some of his assets by purchasing them on credit and promising to pay for them at some future date. The persons to whom such debts are owed, who are referred to as *creditors,* have claims against the assets of the business until the debts are paid. These claims of the creditors are called the *liabilities* of the business.

Proprietorship. If the assets are owned free of debt, the proprietor may claim the entire value of the assets for himself. His claim against the assets is called his *proprietorship* or capital.*

When a business has liabilities, however, the owner can claim for himself only the value that remains after deducting the liabilities, or claims of the creditors. For example, James King, owner of a grocery business, owes the National Wholesale Company $400 and the Central Produce Company $200 for merchandise purchased from them on account. The total liabilities are $600. If King is using assets worth $15,800, the amount of King's proprietorship is $15,800 − $600, or $15,200. This relationship is expressed by the equation,

Assets $15,800 − Liabilities $600 = Proprietorship $15,200

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*Other terms that mean the same as proprietorship, or capital, are *investment, net investment,* and *net worth.*

The Balance Sheet. At regular intervals, at least as often as once a year, the owner of a business takes an inventory of the assets and liabilities and prepares a formal statement showing the assets, liabilities, and proprietorship of the business. This statement is known as a *balance sheet.*

The following is the balance sheet of James King on July 31, 19--:

JAMES KING

BALANCE SHEET, JULY 31, 19--

Assets		*Liabilities*	
Cash	700	National Wholesale Co.	400
Merchandise Inventory	7,800	Central Produce Co.	200
Store Supplies	100	Total Liabilities	600
Store Equipment	7,200		
		Proprietorship	
		James King, Capital	15,200
Total Assets	15,800	Total Liab. and Prop.	15,800

Balance Sheet

The form in which the balance sheet is prepared, with the assets on the left and the liabilities and proprietorship on the right, is based on the fact that the sum of all the claims against the assets of the business is equal to the value of the assets. This relationship may be expressed by the equation,

Assets $15,800 = Liabilities $600 + Proprietorship $15,200

Exercise 1. (Written)

1. Walter Hoit, owner of a retail hardware store, takes an inventory of his assets and finds that he has the following items: cash amounting to $200, merchandise worth $7,500, store supplies worth $60, and store equipment worth $700. An examination of his unpaid bills reveals that he owes the Detroit Manufacturing Co. $100 and the Acme Tool Co. $400 for merchandise he purchased from them on account. (a) What is the total value of his assets? (b) What is the total amount of his liabilities? (c) What is the amount of his proprietorship?

2. H. M. Smith, owner of an appliance business, has the following assets: cash, $1,200; merchandise, $5,000; store supplies, $150; store equipment, $600; delivery equipment, consisting of two automobile trucks, $2,200; and land and building, $7,500. He owes the First Trust Company $500 and the Standard Manufacturing Company $1,000. Find (a) the total assets, (b) the total liabilities, and (c) the amount of the proprietorship.

3. C. F. Wing, coal dealer, owns the following assets: cash, $700; merchandise, $3,600; office supplies, $25; office equipment, $350; delivery equipment, $1,500; and land and buildings, $8,500. He owes the Lehigh Coal Company $450 and the Reading Coal Company $500. Find (a) the total assets, (b) the total liabilities, and (c) the amount of the proprietorship.

4. P. C. Dodge, who is engaged in the retail hardware business, has the following assets and liabilities on June 30 of the current year:

Cash	$ 912.56	Debt owed First Nat'l Bank	500.00
Merchandise Inventory	7,149.80	Debt owed E. D. Kruze	827.62
Store Supplies	52.18		
Furniture and Fixtures	650.00		
Delivery Equipment	900.00		

Prepare a balance sheet for P. C. Dodge as of June 30.

5. C. A. Anderson, who is engaged in the retail implement business, had on December 31 of last year the following assets and liabilities:

Cash	$ 324.24	Debts owed creditors as follows:	
Merchandise Inventory	8,157.68	H. M. Gould	$117.40
Furniture and Fixtures	375.00	A. M. Joesting	142.37
Delivery Equipment	825.00		

Prepare a balance sheet for C. A. Anderson as of December 31.

6. Walter Blass, owner of a radio and electrical supply business, has the following assets and liabilities on July 31 of the current year: cash, $762.18; merchandise inventory, $7,649.55; store supplies, $39.40; land and building, $6,800; store equipment, $565; delivery equipment, $835; debt owed to Allen Radio Co., $416.42; debt owed to Second Trust Co., $350. Prepare a balance sheet for Walter Blass as of July 31.

Problems for Application and Review

Group A

1. (a) Multiply 280 by $1\frac{5}{8}$. (b) Find the number of days from March 19 to July 14. (c) Express a tax rate of $22.50 on $1,000 as a rate in mills on $1. (d) Find the interest at 6% on $1,150 for 17 days.

2. John Moody, a furniture dealer, has the following assets and liabilities on September 30: cash, $515.40; merchandise inventory, $8,794.65; store supplies, $69.40; office supplies, $56.50; land and building, $7,700; store fixtures, $824.75; delivery equipment, $1,825; debt owed to Globe Furniture Co., $641.85; debt owed to G. Weiss & Co., $219.45. Prepare a balance sheet for John Moody as of September 30.

3. The tax rate in a certain village is $4.863 per $100. What is the tax on a piece of property assessed at $5,600?

4. What is the amount of Elmer Green's annual income from 125 shares of Gem Manufacturing Company stock if the stock pays a regular quarterly dividend of 87½¢ a share?

5. A man borrowed $900 for one month. The interest on the loan amounted to $3.75. What rate of interest did he pay?

Group B

1. (a) .03 times what amount equals $17.85? (b) Multiply 380 by 1⅓. (c) What amount is 42% greater than $27? (d) Express 12.5 mills as a decimal part of $1. (e) Find the interest on $950 for 77 days at 6%.

2. Thomas Wood, owner of a variety store, has the following assets and liabilities on February 1 of the current year: cash, $642.10; merchandise inventory, $3,421.75; store supplies, $26.55; office supplies, $10.20; land and building, $9,500; furniture and fixtures, $970; debt owed to Barton Supply Co., $218.45; debt owed to Wilson & Wyatt, $302.60. Prepare a balance sheet for Thomas Wood as of February 1.

3. In a certain village having 1,250 inhabitants, $58,954 was collected in taxes. Find to the nearest mill the amount of tax per inhabitant.

4. The May reading of a gas meter was 71,400 cubic feet while the April reading was 67,800 cubic feet. At 95¢ per thousand cubic feet, find the amount of the gas bill for May.

5. Stevens insures his $12,000 house at 90% of its value. At a rate of 39¢ per $100, find the amount of the premium.

Section 2 . . . The Profit and Loss Statement

Gross Sales, Returns and Allowances, Net Sales. In any mercantile business, the merchandise is sold at a higher price than the cost in order to make a profit. The total amount received for merchandise sold over a given period of time, such as a day, week, or month, is called the *gross sales* for the period.

Refunds to customers are sometimes made for returned goods or for allowances because of defective merchandise. Such refunds decrease the income from the sales and should therefore be deducted from the gross sales. The amount remaining is known as the *net sales* for the period. Expressed as a formula,

Gross Sales − Returns and Allowances = Net Sales

For example, if James King has gross sales for the month of July amounting to $10,050, and returns and allowances amounting to $50, his net sales for the month are $10,000.

Gross Sales	$10,050
Returns and Allowances	50
Net Sales	$10,000

The information about the amount of the gross sales and the returns and allowances is obtained from the bookkeeping records, in which the proprietor or his bookkeeper keeps a daily record of those items. The totals of the daily records provide the data used in finding the net sales for the period.

Gross Profit. The amount remaining after deducting the cost of goods sold from the net sales is known as the *gross profit* or *gross margin.* The relationship of the gross profit to the net sales and cost of goods sold is expressed by the formula,

Net Sales − Cost of Goods Sold = Gross Profit

If, for the month of July, James King sells for $10,000 merchandise that cost him $8,000, his gross profit for the month is $2,000.

Net Sales	$10,000
Cost of Goods Sold	8,000
Gross Profit	$ 2,000

Computing the Cost of Goods Sold. Usually it is impractical to make a record of the cost price of an article at the time the article is sold. Instead, inventories are taken of the merchandise on hand at the beginning and end of the period under consideration. The cost of the goods sold is then computed by subtracting the ending inventory from the sum of the beginning inventory and the cost of the goods purchased.

Beginning Inventory + Purchases − Ending Inventory = Cost of Goods Sold

For example, on July 1 James King's merchandise inventory was $8,200. During July he purchased additional merchandise costing $7,600. On July 31 his merchandise inventory was $7,800. The cost of the goods he sold during July was $8,000, computed as follows:

Merchandise Inventory, July 1	$ 8,200
Purchases	7,600
Merchandise Available for Sale	$15,800
Merchandise Inventory, July 31	7,800
Cost of Goods Sold	$ 8,000

The proprietor or his bookkeeper keeps a daily record of the cost of all merchandise purchased. The total of the daily records for the period provides the amount of the item *purchases*, used above in finding the cost of goods sold for the month.

Exercise 2. (*Written*)

1. The gross sales of the Wallace Store for the month of June amounted to $8,462.17. The sales returns and allowances amounted to $92.68. What were the net sales for the month?

2. For the first quarter of the year the Hahn Store had gross sales amounting to $71,484.31 and returned sales amounting to $697.48. The cost of goods sold was $46,595.61. (a) What were the net sales for the quarter? (b) What was the gross profit?

3. The records of Webber & Lane, furniture dealers, show the following for the first half of the year: stock of merchandise on hand January 1, $41,250; cost of additional merchandise purchased during the period, $36,125; stock of merchandise on hand June 30, $37,625. What was the cost of the goods sold?

4. The records of the Bon Ton Millinery Shop show the following for the quarter ending June 30: merchandise inventory April 1, $4,100; purchases for the quarter, $6,650; net sales for the quarter, $11,425; merchandise inventory June 30, $4,400. (a) Find the cost of goods sold for the period. (b) Find the gross profit.

Net Profit. In any mercantile business it is necessary to incur expenses for such items as rent, wages, advertising and other expenses connected with the operations of the business.

These expenses, which are called the *operating expenses, overhead,* or *cost of doing business,* decrease the profits of the business and must therefore be subtracted from the gross profit. The amount remaining is known as the *net profit.* Hence the formula,

Gross Profit − Operating Expenses = Net Profit

Thus, if James King's gross profit for the month of July is $2,000 and his operating expenses for the month are $1,500, his net profit for the period is $500.

Gross Profit on Sales	$2,000
Operating Expenses	1,500
Net Profit	$ 500

Net Loss. If the operating expenses are greater than the gross profit, the gross profit is subtracted from the operating expenses. The result is a *net loss.* This may be expressed by the formula,

Operating Expenses − Gross Profit = Net Loss

Exercise 3. (*Written*)

1. For the six-month period ending June 31, the Grossman Company had gross sales amounting to $57,450 and sales returns amounting to $575. The cost of goods sold was $38,245 and the operating expenses $13,985. Find (a) the net sales, (b) the gross profit, and (c) the net profit or net loss for the period.

2. Joel Dolven, haberdasher, had net sales of $7,845 for the month of February. Operating expenses for the month totaled $2,640 and the cost of goods sold amounted to $5,490. (a) What was his gross profit for the month? (b) What was the amount of his net profit or net loss for the month?

3. The records of I. J. Marx showed the following for the year ending December 31: merchandise inventory January 1, $18,000; purchases, $46,000; net sales, $80,000; merchandise inventory December 31, $16,000; operating expenses, $24,000. Find (a) the cost of goods sold, (b) the gross profit, and (c) the net profit.

4. In Problem 3, above, what per cent of the net sales is (a) the gross profit, (b) the operating expenses, and (c) the net profit?

Profit and Loss Statement. At regular intervals, in some cases as often as once a month, the owner of a business prepares a formal statement of his sales, cost of goods sold, operating expenses, and net profit. This statement is known as a *profit and loss statement.* The following is James King's profit and loss statement for the month of July, 19--:

JAMES KING
PROFIT AND LOSS STATEMENT
FOR THE MONTH ENDING JULY 31, 19--

Net Sales		$10,000
Cost of Goods Sold:		
Merchandise Inventory, July 1	$ 8,200	
Purchases	7,600	
Merchandise Available for Sale	$15,800	
Merchandise Inventory, July 31	7,800	
Cost of Goods Sold		8,000
Gross Profit on Sales		$ 2,000
Operating Expenses:		
Wages	$ 975	
Advertising	80	
Rent	250	
Heat, Light, and Water	40	
Depreciation of Equipment	60	
Miscellaneous Expenses	95	
Total Operating Expenses		1,500
Net Profit		$ 500

Profit and Loss Statement

Information needed for preparing the profit and loss statement is obtained from the bookkeeping records, in which a daily record is kept of the sales, purchases, and expenses of the business.

Percentage Analysis of the Profit and Loss Statement. Many businessmen follow the practice of making a percentage analysis of the profit and loss statement. This analysis shows what per cent each major item on the statement is of the net sales.

The percentage analysis of James King's profit and loss statement for July, in condensed form, is shown below.

Net Sales	$10,000	100%
Cost of Goods Sold	8,000	80%
Gross Profit on Sales	$ 2,000	20%
Operating Expenses	1,500	15%
Net Profit	$ 500	5%

In computing the percentages, the net sales are always used as the base, or whole, with which the subsequent items of the statement are compared. The net sales are therefore always 100%.

Exercise 4. (*Oral*)

State the percentage analysis of each of the condensed profit and loss statements given below.

	1.	2.	3.
Net Sales	$3,000	$5,000	$4,000
Cost of Goods Sold	2,100	3,000	2,600
Gross Profit	$ 900	$2,000	$1,400
Operating Expenses	600	1,250	1,200
Net Profit	$ 300	$ 750	$ 200

Rate of Net Profit on Investment. At the end of the year or other fiscal period, the owner of a business usually compares the net profit for the period with the amount of his proprietorship, or investment in the business, at the beginning of the period. This comparison, which is expressed as a per cent, is referred to as the *rate of net profit on investment* and is computed by dividing the net profit by the investment. Expressed as a formula,

$$\text{Rate of Net Profit on Investment} = \frac{\text{Net Profit}}{\text{Investment}}$$

The rate of net profit on investment is always expressed as an annual rate. In cases where the net profit is for a period less than a year, the result should be converted to the equivalent rate on an annual basis. A rate figured on the profit for one month, for example, should be multiplied by 12 and thus converted into an annual rate.

Exercise 5. (*Written*)

In each of the following problems carry each result to the nearest tenth per cent.

1. The balance sheet of C. J. Marlow, furniture dealer, prepared at the beginning of the year, showed the proprietorship to be $40,000. His statement of profit and loss, prepared at the end of the year, showed net sales of $60,000 for the year and a net profit of $3,550. (a) The net profit is what per cent of the net sales? (b) What is the rate of net profit on investment?

2. G. F. Crannell, lumber dealer, began the year with a proprietorship of \$51,000. (a) If his net profit for the year was \$4,610, what was the rate of net profit on investment? (b) What was the rate of net profit on sales if the net sales for the year amounted to \$75,000?

3. At the beginning of the year the Anderson Department Store had assets amounting to \$70,000 and liabilities amounting to \$17,000. The statement of profit and loss for the year showed net sales amounting to \$125,000; cost of goods sold, \$82,000; and operating expenses, \$39,100. (a) What was the rate of net profit on sales? (b) What was the rate of net profit on investment?

4. The net sales of K. A. Lawlor, hardware dealer, were \$35,000 for the first half of the year, and his net profit was \$1,500. His proprietorship at the beginning of the year was \$43,000. (a) What was the rate of net profit on sales? (b) What was the rate of net profit on investment, expressed as an annual rate?

Problems for Application and Review

Group A

1. (a) .04 times what amount equals \$25.22? (b) Divide 25 by $1\frac{3}{8}$. (c) Express a tax rate of 13.2 mills on \$1 as a rate on \$1,000. (d) Find the interest on \$1,450 for 13 days at $7\frac{1}{2}\%$. (e) What part less than 255 is 170?

2. The records of Vera's Gift Shop for the month of July show the following: merchandise inventory July 1, \$1,980; merchandise inventory July 31, \$1,570; purchases, \$445; net sales, \$1,385; expenses, \$156. Find (a) the cost of goods sold for the month, (b) the gross profit, and (c) the net profit.

3. In one district the total assessed valuation is \$10,433,799. The largest individual property owner is assessed \$579,750. Find, to the nearest tenth per cent, what per cent of the total taxes this property owner must pay.

4. George Allen owned a building used for store purposes, valued at \$18,000, and carried a stock of goods inventoried at \$5,250. He insured the building for 80% of its value at \$1.65 per \$100 for three years and the stock for the inventoried value at \$1.20 per \$100 for one year. Find the total yearly cost of the insurance.

5. How much money will Arthur Burns have to invest in Southern Utility Company $4\frac{1}{2}\%$ bonds, par value \$1,000, selling at $93\frac{3}{4}$ plus $2.50 brokerage fee per bond, in order that he may secure an annual income of $1,575 from his investment?

6. On July 7, M. B. Harvey gave his note for $250 for three months with interest at 6%. At maturity he paid the interest and $50 on the principal and gave a new three-month note, with interest at 6%, for the balance. He also paid the second note at maturity with interest in full. Find the amount of the last payment.

Group B

1. (a) Multiply 30 by $1\frac{3}{8}$. (b) Divide 18 by $1\frac{2}{3}$. (c) Express a tax rate of $21 on $1,000 as a rate in mills on $1. (d) Find the interest at 6% on $875 for 73 days. (e) $24 is what part greater than $14.40? (f) $360 is 4% less than what amount?

2. The net sales of L. J. Alcott, a retail grocer, for the first six months of last year were $24,950. His merchandise inventory on January 1 was $2,160 and on June 30, $3,500. Purchases of merchandise for the six months totaled $20,500, and operating expenses consisted of the following: salaries and wages, $2,630; advertising, $320; repairs and depreciation, $150; other expenses, $795. Find the amount of his net profit for the period.

3. H. W. Henry bought an automobile for $2,715. He paid $915 cash. The balance was handled through a finance company to which Henry was to make equal monthly payments for 18 months. The company's carrying charge for the transaction amounted to $162. What amount did Henry pay each month?

4. At what rate of interest must a man loan $400 so that he will receive $36 interest for a period of two years?

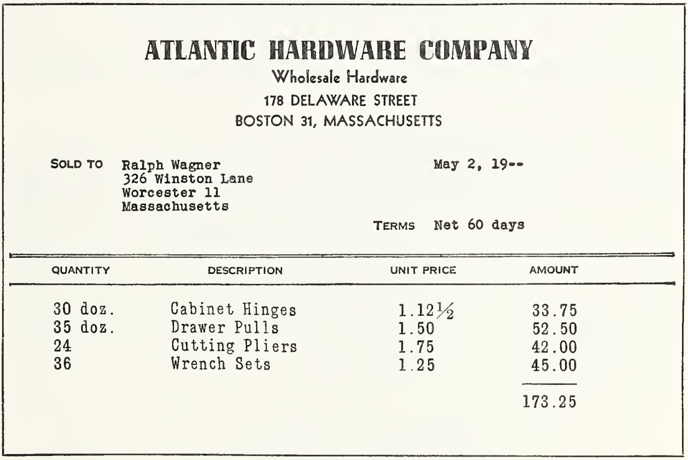
5. The Genesee Woolens Company pays S. W. Wall, a salesman, a salary of $250 a month. In addition, Wall earns 2% commission on his sales up to and including $4,000 a month and 3% commission on any amount in excess of $4,000. In April, Wall's sales amounted to $3,160 and in May, $5,660. What is the total amount of Wall's earnings for the two months?

6. The Ames Company offered Vandenburgh, a salesman, a commission of 8% on the first $3,000 of sales and 10% on all sales in excess of $3,000. The Brown Company offered him a monthly salary of $300 and 3% commission on all sales. His average sales amount to $4,600 a month. Calculate the amount Vandenburgh would make per month (a) if he worked for the Ames Company and (b) if he worked for the Brown Company.

Section 3 . . . Purchases and Purchases Records

Purchase Order. When the retailer finds that additional items of merchandise are needed, he places an order with a wholesale dealer or with a factory. This order may take the form of a letter containing a list of the articles he desires; or the retailer may use a printed order blank of his own or one furnished by the wholesaler.

Purchase Invoice. Upon filling and shipping the order, the wholesaler mails the retailer an invoice, which is an itemized statement of the quantity and price of each item shipped. The following illustration shows the invoice that Ralph Wagner, retail hardware dealer, received from the wholesaler, Atlantic Hardware Company, covering a shipment of goods ordered by Wagner.



ATLANTIC HARDWARE COMPANY
Wholesale Hardware
178 DELAWARE STREET
BOSTON 31, MASSACHUSETTS

SOLD TO Ralph Wagner
326 Winston Lane
Worcester 11
Massachusetts

May 2, 19--

TERMS Net 60 days

QUANTITY	DESCRIPTION	UNIT PRICE	AMOUNT
30 doz.	Cabinet Hinges	1.12½	33.75
35 doz.	Drawer Pulls	1.50	52.50
24	Cutting Pliers	1.75	42.00
36	Wrench Sets	1.25	45.00
			173.25

Invoice

Checking the Purchase Invoice. As soon as the invoice is received, the purchaser should check it with his copy of the purchase order to make sure that the goods listed on the invoice are the same as those ordered.

When the shipment arrives, the articles received should be examined as to quality and checked with the invoice as to quantity.

The extensions and the total amount on the invoice should then be recalculated and a notation made of any errors that are discovered.

Terms. It is common practice among wholesalers and manufacturers to sell *on account*, or *on credit*, allowing the customer a *credit period* of 30 to 90 days in which to pay for the goods. This plan is helpful to the customer as it gives him time to sell a part or all of the goods before payment is due and in this way obtain funds for making the payment.

The credit period allowed by the seller is specified on the invoice by the terms. By examining the invoice in the illustration, you will observe the expression "Terms Net 60 days" in the lower right-hand corner of the heading of the invoice. The *terms* specify the length of the credit period and indicate when the invoice is due for payment. Terms of "Net 60 days," or "n/60" as it is often written, means that credit is granted for a period of 60 days and that the full amount is due for payment 60 days after the date of the invoice.

Determining the Due Date of an Invoice. The due date of an invoice is found by counting ahead, from the date of the invoice, the number of days specified in the terms.

For example, the invoice in the illustration on page 309 is dated May 2, and the terms of the invoice are n/60. The invoice is due for payment 60 days after May 2, or on July 1, computed as shown at the left.

60 days
29 days left in May
31
30 days in June
1 day in July

Exercise 6. (***Written***)

1. The following invoice has been received and you are asked to verify the extensions and the total:

12 dozen bars Soap	@	$ .83	$ 9.96
15 dozen cans Tomatoes	@	2.65	39.75
6 dozen cans Peaches	@	5.48	32.88
5 dozen cans Asparagus	@	5.09	25.45
9 dozen cans Cherries	@	3.98	35.72
25 dozen cans Salmon	@	4.65	116.25
			$260.11

Copy the invoice on a separate sheet of paper. Then as you verify the correctness of each figure, place a check mark (√) at its immediate right. This mark indicates work completed and guards against repetition and confusion.* If a figure is incorrect, indicate at the right the correct amount.

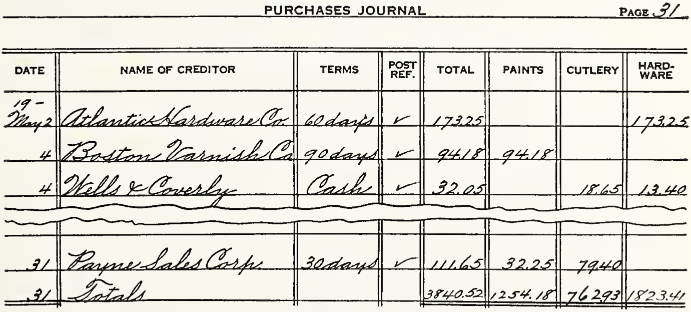
*Check marks are regularly used by office clerks and bookkeepers to indicate that figures have been verified for accuracy.

2. The Hamilton Hardware Company purchased the following items from the Reynolds Paint Company; invoice dated March 18; terms net 60 days:

48 gal.	Enamel	@	$1.12½
56 qt.	Spar Varnish	@	1.25
24 gal.	Screen Enamel	@	1.62½
36 gal.	Barn Paint	@	2.25
16 gal.	Metal Primer	@	2.75
180 qt.	House Paint	@	.75
120 qt.	Porch Paint	@	.62½

You are (a) to make the extensions, (b) to find the total amount of the invoice, and (c) to find the due date of the invoice.

Purchases Records. In every mercantile business, an accurate record is kept of all purchase invoices, usually in a book called the *purchases journal.* The illustration below shows the purchases journal used by Ralph Wagner, owner of a retail hardware business.



PURCHASES JOURNAL PAGE 31

DATE	NAME OF CREDITOR	TERMS	POST REF.	TOTAL	PAINTS	CUTLERY	HARDWARE
19– May 2	Atlantic Hardware Co.	60 days	✓	173.25			173.25
4	Boston Varnish Co.	90 days	✓	94.18	94.18		
4	Wells & Coverly	Cash	✓	32.05		18.65	13.40
31	Payne Sales Corp.	30 days	✓	111.65	32.25	79.40	
31	Totals			3840.52	1254.18	762.93	1823.41

Purchases Journal

In the purchases journal shown above, Mr. Wagner records the total of each invoice in the "Total" column and then shows in the columns at the right the amounts that apply to each of the three departments into which his store is divided; namely, paints, cutlery, and hardware. The column totals show the total purchases for the month for the store as a whole and for each department.

If goods are returned to the seller for one reason or another, or if the buyer is granted an allowance (reduction in price) because of damaged or defective merchandise, a record of the return or allowance is kept in a book called the *purchases returns and allowances journal,* which is similar to the purchases journal. Ralph Wagner's purchases returns and allowances journal is shown below.

PURCHASES RETURNS AND ALLOWANCES JOURNAL PAGE 8

DATE	NAME OF CREDITOR	POST REF.	TOTAL	PAINTS	CUTLERY	HARD-WARE
19— May 8	Atlantic Hardware Co.	✓	7.75			7.75
8	Hamlin Bros.	✓	21.25	11.75	9.50	
28	White & Samson	✓	8.30		2.40	5.90
31	Totals		54.96	18.48	14.31	22.17

Purchases Returns and Allowances Journal

Gross Purchases, Returns and Allowances, and Net Purchases. When a business has purchases returns and allowances, the total of the purchases journal is referred to as the *gross purchases* for the month. The total returns and allowances are subtracted from the gross purchases to find the net purchases.

Gross Purchases − Returns and Allowances = Net Purchases

Thus, the net purchases of Ralph Wagner for the month of May are $3,785.56, computed as follows:

Gross purchases	$3,840.52
Returns and allowances	54.96
Net purchases	$3,785.56

Exercise 7. (*Written*)

1. During the first 6 months of the year the Johnson Company bought merchandise amounting to $29,675.87. Its returns and allowances amounted to $1,362.55. Find, to the nearest tenth per cent, what per cent the returns and allowances were of the gross purchases for the period.

2. Last month the Compton Drug Company made the purchases and purchases returns shown in the table below.

Copy the table and show: (a) the net purchases of each item, (b) the total gross purchases, (c) the total returns, and (d) the total net purchases. (e) Prove the total net purchases by subtracting the total returns from the total gross purchases.

ITEMS	GROSS PURCHASES	RETURNS	NET PURCHASES
Drugs	$3,251	$226	?
Cosmetics	5,678	307	?
Fountain Supplies	1,221	35	?
Stationery	2,107	79	?
Novelties	787	46	?
Totals	?	?	?

3. The table below at the left shows the purchases for the three departments of Rector's Clothing Store for the first three months of the current year.

MONTH	CLOTHING	HATS	SHOES	TOTAL PURCHASES
Jan.	$682	$236	$268	?
Feb.	813	309	291	?
Mar.	947	281	312	?
Totals	?	?	?	?

Copy the table and show: (a) the total purchases for each month, (b) the total purchases of each department for the three months, and (c) the total purchases for the three months. (d) Prove the total of the "Total Purchases" column by adding the totals of the columns at the left.

ALIQUOT PARTS (*Continued*)

Combinations of Aliquot Parts. The unit price of an item on an invoice is sometimes a combination of an aliquot part and the base.

For example, on the invoice shown on page 309, the unit price of the first item is $\$1.12\frac{1}{2}$. $\$1.12\frac{1}{2}$ is equivalent to $\$1 + \$.12\frac{1}{2}$. Since $\$.12\frac{1}{2}$ is $\frac{1}{8}$ of \$1, $\$1.12\frac{1}{2}$ is equivalent to $\$1 + \frac{1}{8}$ of \$1.

Similarly, $\$1.37\frac{1}{2}$ is equivalent to $\$1 + \frac{3}{8}$ of \$1; \$1.50 is equivalent to $\$1 + \frac{1}{2}$ of \$1; $\$1.62\frac{1}{2}$ is equivalent to $\$1 + \frac{5}{8}$ of \$1; and so on. In each case, the unit price is equivalent to the base plus a fractional part of the base.

Some of the commonly used combinations of aliquot parts of 10¢ and $1 are the following:

12½¢ = 10¢ + ¼ of 10¢
15¢ = 10¢ + ½ of 10¢
$1.12½ = $1 + ⅛ of $1
$1.25 = $1 + ¼ of $1
$1.33⅓ = $1 + ⅓ of $1

$1.37½ = $1 + ⅜ of $1
$1.50 = $1 + ½ of $1
$1.62½ = $1 + ⅝ of $1
$1.75 = $1 + ¾ of $1
$1.87½ = $1 + ⅞ of $1

Multiplication by Combinations of Aliquot Parts. The principle of multiplication by aliquot parts may be applied to multiplication by combinations of aliquot parts.

Example: Find the cost of 30 dozen hinges at $1.12½ a dozen.

Solution: *$1.12½ = $1 + ⅛ of $1*
30 × $1 = $30
$30 × ⅛ = $3.75
$30 + $3.75 = $33.75 Ans.

Exercise 8. (*Oral*)

For each of the following problems, recite the solution and give the product of the indicated multiplication.

	1.	**2.**	**3.**	**4.**
a.	28 @ 12½¢	15 @ $1.33⅓	130 @ 15¢	220 @ $1.25
b.	26 @ 15¢	32 @ $1.37½	36 @ $1.25	120 @ $1.37½
c.	22 @ $1.50	48 @ $1.62½	40 @ $1.62½	108 @ $1.33⅓
d.	44 @ $1.25	16 @ $1.87½	45 @ $1.50	32 @ $1.87½
e.	16 @ $1.75	66 @ $1.33⅓	36 @ 12½¢	35 @ $1.50
f.	88 @ $1.12½	32 @ $1.75	96 @ $1.12½	56 @ $1.12½

Problems for Application and Review

Group A

1. (a) .01½ times what amount equals $14.37? (b) What per cent of $37.50 is $90? (c) $225.50 is what per cent less than $275? (d) Find the interest on $1,375 for 14 days at 6%.

2. The records of B. A. Rose, a clothing merchant, show the following for the first quarter of last year: net sales, $13,730; net purchases, $8,220; merchandise inventory January 1, $13,720; merchandise inventory March 31, $12,420. Operating expenses for the period were $2,588. Find the net profit for the period.

3. An invoice containing the following items has been received and you are asked to verify the extensions and total. Point out any errors you find and give the correct amount of the invoice.

25 cases canned beets	@	$4.15	$103.75
33 cases canned peas	@	7.05	232.65
5 cases canned beans	@	5.87½	29.38
24 cases canned tomatoes	@	5.12½	133.00
			$499.78

4. A store building valued at $40,000 is insured for $31,500 under a policy carrying a 90% coinsurance clause. Fire damaged the building to the extent of $21,000. (a) What amount was the insurance company required to pay? (b) What per cent of the fire loss was borne by the owner?

5. Find (a) the due date and (b) the amount due at maturity on a 70-day, 4% note for $495.50, dated July 13.

Group B

1. (a) Divide 24 by $1\frac{3}{4}$. (b) What amount increased by $\frac{2}{3}$ of itself equals $9.30? (c) $25.20 is what per cent more than $22.50? (d) $55.80 is 55% more than what amount? (e) Find the interest at 6% on $625 for 74 days.

2. Verify the following extensions on an invoice. Point out any errors and give the correct total.

250 notebooks	@	$24.00 per C	$60.00
7 dozen rulers	@	15.50 per gross	9.40
5 gross pens	@	.60 per gross	3.00
9 dozen blotters	@	.50 per gross	.38
15 quart bottles ink	@	10.00 per dozen	11.50
			$74.28

3. A house is valued at $12,000 and its contents at $4,500. The house is insured for 75% of its value at 50¢ per $100 for three years. The contents are insured for the full value at an annual rate of 35¢ per $100. (a) What was the amount of the premium paid for insuring the house? (b) Find the total annual cost of carrying both insurance policies?

4. What monthly rent must be charged for a house costing $13,500 to realize a net income of 5% on the investment if taxes are $325, repairs and depreciation, $530, and insurance, $30?

Section 4 . . . Trade Discount

List Price, Trade Discount, and Invoice Price. Many wholesalers and manufacturers offer their goods to the retailer at a price called the *list price*, or *catalog price*, and allow the retailer a *discount* or deduction from this price. A discount of this kind is known as a *trade discount*, because it is allowed only to a dealer in the trade; that is, to a person, such as a retailer, engaged in the business of buying and selling such articles.

The price of the article to the retailer is the list price less the trade discount, and is referrred to as the *invoice price* or *invoice cost.*

To Find the Trade Discount and the Invoice Price. The trade discount allowed by a wholesaler or manufacturer is usually expressed as a per cent. This per cent is always based on the list price. Since the list price is the base, it is multiplied by the per cent, or rate of discount, to find the amount of the trade discount.

Rate of Trade Discount × List Price = Trade Discount

Since the trade discount represents a deduction from the list price, the trade discount is subtracted from the list price to find the invoice price.

List Price − Trade Discount = Invoice Price

Example: The list price of a radio in the catalog of the Truetone Radio Manufacturing Company is $38.50. If the discount allowed to a retailer is 40%, how much does the retailer pay for the radio?

Solution:

List price	*$38.50*	
Trade discount	*15.40*	*(40% of $38.50)*
Invoice price	*$23.10*	*Ans.*

Where more than one item is subject to the same rate of discount, the amount of the discount is calculated on the total list price of all the items.

In cases where no trade discount is allowed, the invoice price of the article is the same amount as the list price.

Checking the Calculation of the Invoice Price. The calculation of the invoice price may be checked first by calculating the invoice price in terms of per cent and then by applying that per cent to the list price.

In the foregoing example, the trade discount is 40% *of the list price.* Hence the list price is the *base,* or whole, and represents 100% of itself.

Since *List Price − Trade Discount = Invoice Price,* the invoice price, expressed in terms of per cent, is 100% − 40%, or 60% *of the list price.* The amount of the invoice price is therefore 60% of $38.50, or $23.10. Thus,

	100% of List Price	=	List Price
Subtracting,	40% of List Price	=	Trade Discount
	60% of List Price	=	Invoice Price
Substituting $38.50 for List Price,	60% of $38.50	=	Invoice Price
		=	$23.10

Reasons for Allowing Trade Discounts. Trade discount is used extensively in lines of business where a wholesaler or manufacturer must sell articles by catalog and where, in addition, changes in production costs necessitate frequent changes in prices. The wholesaler or manufacturer supplies each retailer with a catalog and a *discount sheet,* the latter showing the trade discounts allowed on the prices quoted in the catalog. When price changes become necessary, the trade discount rates are changed, rather than the prices in the catalog, and a revised discount sheet is sent to each retailer. In such cases, trade discount is used to save the wholesaler or manufacturer the expense of printing new catalogs.

In some lines of business the catalog price is the price at which the wholesaler or manufacturer advertises the article for sale to the consumer. When this is the case, a trade discount on the catalog price is granted the retailer to enable him to sell the article at the advertised price and make a satisfactory profit on the sale. If the retailer sells the article at the advertised catalog price, his gross profit will be the same as the amount of the trade discount.

The trade discount is also used to induce the purchaser to buy in large quantities. For example, a discount of 10% may be allowed on a purchase of 100 articles; 12% on a purchase of 200; 15% on a purchase of 300; etc. A trade discount of this type is sometimes referred to as a *quantity discount.*

Exercise 9. (*Written*)

In each of the first five problems in this exercise the invoice price is to be found by the method explained on page 316 and then checked by the method explained on page 317.

1. A retail dealer purchases a washing machine listed in the manufacturer's catalog at $180, less 35%. What is the invoice price of the washing machine?

2. A vacuum cleaner, listed in the manufacturer's catalog at $79.50, is sold to a retailer at 33⅓% off list. What is the invoice price to the retailer?

3. How much would the Selkirk Hardware Store have to pay for 15 dozen hammers if the quoted price of the hammers is $18 a dozen, less 32%?

4. John B. Hauf, owner of a household furniture store, obtains price quotations on rugs from two wholesale concerns. The Wilton Sales Agency offers a certain rug for $85, less 40%. The firm of Pierce and Son offers the same rug for $75, less 33⅓%. (a) What will be the invoice price if the rug is purchased from the Wilton Sales Agency? (b) What will be the invoice price if the rug is purchased from Pierce and Son? (c) Which firm makes the better offer? (d) How much better?

5. The Rand Manufacturing Company offers to sell a dining-room suite to Byron Wilcox, furniture dealer, for $250, less 30%. The Gayton Furniture Company offers a suite of similar quality for $225, less 20%. (a) Which is the better offer? (b) How much is saved by taking advantage of it?

6. A stove listed in the Fuller-Warren Stove Company's catalog at $80 is billed to the retailer at $48. (a) What is the amount of the trade discount? (b) The trade discount is what per cent of the list price?

7. The invoice price of an automobile tire is $12.60, after deducting a trade discount of $4.20 from the list price. (a) What is the list price of the tire? (b) The trade discount is what per cent of the list price?

To Find the Rate of Trade Discount. The rate of trade discount is always based on the list price. Hence, the rate may be found by dividing the amount of the trade discount by the list price.

$$\textbf{Rate of Trade Discount} = \frac{\textbf{Trade Discount}}{\textbf{List Price}}$$

Exercise 10. (*Written*)

1. A catalog lists an electric motor at $90. The same motor is billed to the retail dealer at $72. What rate of trade discount is allowed?

2. An electric range listed at $280 is sold to the retailer at $182. What is the rate of trade discount?

3. If an article is billed to the retailer at $42.50 after deducting $7.50 from the catalog price, what rate of trade discount is allowed?

4. A living-room suite listed at $260 is billed to the retailer at $227.50. What is the rate of trade discount?

5. What rate of trade discount is allowed on an article that is billed to the dealer at $87.50 after deducting $17.50 from the list price?

Exercise 11. (*Written*)

1. The Empire Market ordered $100 worth of packaged cheese from the Valley Dairy Products Company and was given an additional $20 worth free. (a) What was the total value of the goods received by the Empire Market? (b) The value of the free goods is what per cent of the value of the entire shipment?

2. The Calumet Market ordered from the National Wholesale Company 24 cases of salad dressing at $4.50 a case and was given 3 additional cases free. (a) At $4.50 a case, what was the value of the entire shipment? (b) What rate of trade discount is represented by the three cases of free goods?

3. On an order for 5 dozen boxes of face powder at $1.05 a box, a druggist received an extra dozen free. What rate of trade discount does this represent?

4. What is the equivalent rate of discount allowed if a grocer is given an extra case of toilet soap on an order for nine cases?

Trade Discount Series. Frequently, the trade discount allowed on an article consists of two more discounts, called a *discount series*. For example, the Standard Manufacturing Company, a manufacturer of plumbing supplies, lists a bath tub in its catalog at $150 and allows the retailer discounts of 25%, $12\frac{1}{2}$%, and 10%.

When a series of discounts is allowed, the first discount is based on the list price; the second, on the remainder after deducting the first discount; the third, on the remainder after deducting the first two discounts; and so on.

Example: The quoted price of a bath tub is $150, less 25%, 12½%, and 10%. Find (a) the invoice price and (b) the amount of the trade discount.

Solution

(a)	*$150.00*	*list price*	
	37.50	*1st discount (25%, or ¼, of $150)*	
	$112.50	*1st remainder*	
	14.063	*2d discount (12½%, or ⅛, of $112.50)*	
	$ 98.437	*2d remainder*	
	9.844	*3d discount (10%, or 1/10, of $98.437)*	
	*$ 88.593**	*3d remainder, or invoice price*	*$88.59 Ans.*

(b)	*$150.00*	*list price*	*or*	*(b)*	*$37.50*	*1st discount*
	88.59	*invoice price*			*14.063*	*2d discount*
	$ 61.41	*discount*			*9.844*	*3d discount*
					$61.407	*total discount*

$61.41 Ans.

*To insure accuracy in the cents column, intermediate results should be carried correct to 3 decimal places. The final result is rounded to the nearest cent.

The order in which the discounts are taken does not affect the final result. In the foregoing example, the same invoice price would be obtained by taking the discounts in the order, 12½%, 25%, and 10%; in the order, 10%, 25%, and 12½%; or in any other order.

Exercise 12. (Written)

In each of the following find (a) the invoice price and (b) the amount of the trade discount. Check the calculation of the invoice price by taking the discounts in a different order from the one you used first.

	1.		2.		3.	
	List Price	Trade Discounts	List Price	Trade Discounts	List Price	Trade Discounts
a.	$32.00	20%, 10%	$16.00	15%, 10%	$250	20%, 10%, 10%
b.	$33.00	25%, 20%	$ 8.20	35%, 20%	$125	25%, 20%, 10%
c.	$51.75	33⅓%, 20%	$15.00	30%, 10%	$200	50%, 40%, 10%
d.	$16.50	25%, 10%	$80.00	10%, 5%	$120	25%, 20%, 5%
e.	$45.00	10%, 10%	$43.20	20%, 5%	$105	30%, 15%, 10%
f.	$62.50	30%, 20%	$ 9.80	20%, 20%	$265	20%, 20%, 10%
g.	$50.00	37½%, 25%	$35.00	20%, 15%	$180	30%, 20%, 10%

Exercise 13. (*Written*)

In each of the following problems, check the calculation of the invoice cost by taking the discounts in a different order from the one you used first.

1. Gorham and Company purchases a washing machine, list price $140, less 25% and 15%. What is the invoice cost?

2. The McDonough Machinery Company sells a cultivator listed for $294, with discounts of 20%, 12½%, and 5%. Find the invoice cost.

3. What would the Home Hardware Company pay for 32 dozen hatchets listed at $19.75 a dozen, with discounts of 20%, 15%, and 5%?

4. What is the invoice price of 6 automobile tires, purchased by the Rapid Service Auto Company, which are listed at $47.50 each, with the following discounts: 40%, 33⅓%, and 5%?

5. Estes and Company offers to deliver an order for goods at $1,200 list price, less 25%, 20%, and 10%. Burns Bros. offers to deliver similar goods at the same list price less 30%, 20%, and 5%. (a) Which is the better offer? (b) How much would be saved by taking advantage of it?

6. The Winston Furniture Company offers to deliver a bedroom suite to Ludlow & Sullivan at $300 list price, less 30% and 15%. The Raleigh Furniture Company offers to deliver the same kind of suite at $360 list price, less 30%, 15%, and 10%. (a) Which company makes the better offer? (b) How much would Ludlow & Sullivan save by taking advantage of the better offer?

To Find the Single Discount Equivalent to a Discount Series. A retailer who has numerous price quotations to examine will find it advantageous to prepare a table of single discount rates equivalent to the frequently occurring discount series. Considerable time can then be saved in computing the invoice cost on subsequent price quotations by applying the single equivalent rate instead of the individual discounts in the quoted series.

The single discount equivalent to a given series may be calculated in two steps, as follows:

(1) Find the invoice price in per cent by applying the discounts to the list price expressed as 100%.

(2) Subtract the invoice price in per cent from 100%, the list price. The result is the single rate equivalent to the series.

Example: Find the single discount equivalent to the series 20%, 10%, and 5%.

Solution

Step 1

100%	*list price*
20%	*1st discount (20%, or $\frac{1}{5}$, of 100%)*
80%	*1st remainder*
8%	*2d discount (10%, or $\frac{1}{10}$, of 80%)*
72%	*2d remainder*
3.6%	*3d discount (5%, or $\frac{1}{20}$, of 72%)*
68.4%	*3d remainder, or invoice price*

Step 2

100%	*list price*
68.4%	*invoice price*
31.6%	*single discount*

31.6% Ans.

Exercise 14. (*Written*)

In each of the following find the single discount that is equivalent to the series.

1. 25%, 20%
2. 20%, $12\frac{1}{2}$%
3. $16\frac{2}{3}$%, 10%*
4. 25%, 20%, 20%
5. 30%, 20%, $12\frac{1}{2}$%
6. 20%, 20%, $12\frac{1}{2}$%
7. 20%, $16\frac{2}{3}$%, 10%
8. $33\frac{1}{3}$%, 20%, 10%
9. 20%, 10%, 5%

*When finding a single discount equivalent to a series and the series includes a per cent in the form of a mixed number, such as $16\frac{2}{3}$%, this per cent should be applied last to facilitate the calculations.

Problems for Application and Review

Group A

1. (a) Find the product of 65 × $1\frac{2}{3}$. (b) $12 is $\frac{8}{5}$ of what amount? (c) Express a tax rate of 15.3 mills on $1 as a rate on $1,000. (d) Find the interest at 6% on $565 for 83 days.

2. A catalog lists a certain stove at $90. The same stove is billed to merchants at $72. What rate of discount is allowed?

3. C. J. White bought a house for $12,800 and gave in payment $6,800 in cash and a mortgage for $6,000, on which he has to pay $5\frac{1}{2}$% interest. The annual expenses for taxes, insurance, and repairs amount to $630. White receives $110 a month rent for the house. On the $6,800 invested, White could have obtained 3%

income from good securities. How much did he gain annually by investing his money in the house?

4. The assessed valuation of the taxable property of a village is $9,240,300. The total amount necessary to meet the expenses of the village government, including schools, for the coming year is $273,567.85. Of this amount it is estimated that $3,000 will be received from special licenses issued and $33,400 will be received from the state for school purposes. (a) Find the tax rate. Carry the decimal to five places. (b) What tax should Mr. Hawley pay if his property is valued at $8,500 and is assessed at 80% of its value?

5. Kasius insured his house valued at $12,000 for $9,600 at a rate of 35¢ per $100 for 3 years. The contents were insured for $3,600 at 45¢ per $100 for 3 years. (a) Find the total average annual cost of carrying both policies. (b) If the insurance agent received a commission fee of 20% of the premiums, what was the amount of his commission?

Group B

1. (a) .98 times what amount equals $622.30? (b) $16.80 is $\frac{3}{8}$ less than what amount? (c) Find to the nearest cent 133$\frac{1}{3}$% of $35. (d) Express a tax rate of $13.50 on $1,000 as a rate in mills on $1. (e) Find the interest at 6% on $775 for 82 days.

2. The list price of a motor boat is $350, less 10% and 10%. What is the invoice price?

3. An article listed at $30 is sold for $24. What is the rate of discount?

4. What is the rate of return on a 3$\frac{1}{2}$% bond purchased at 87$\frac{1}{2}$?

5. You wish to borrow $150. If you borrow $150 from a bank and pay $50 each month on the principal, the total interest and bank charges will be $3.25. A loan company will lend $150, charging 3% a month interest on the unpaid balance. (a) If you borrow from the loan company and pay $50 each month on the principal, what will be the total interest cost for the three months? (b) Which concern charges the larger amount? (c) How much larger?

6. If a salesman is paid $350 a month and a commission of 1$\frac{1}{4}$% on all sales in excess of $15,000 in any single month, what must be the amount of his sales each month in order that his total monthly earnings may be $500?

Section 5 . . . Buying Expense

Nature of Buying Expense. Buying expense is expense that a merchant incurs in purchasing merchandise and getting it delivered to his place of business. In a small retail business, the buying expense consists chiefly, if not entirely, of transportation expenses, such as freight, express, parcel post, and cartage charges. In a large establishment, where there is usually a purchasing department in charge of a buyer, or purchasing agent, the buying expense also includes the salaries of the buyer and his assistants, and all other expenses connected with the operating of the purchasing department.

Buying expense increases the cost of the merchandise purchased. When there are buying expenses to be considered in connection with a purchase, the invoice price is referred to as the *prime cost* of the merchandise; and the sum of the prime cost and the buying expense is called the *gross cost.*

Prime Cost + Buying Expense = Gross Cost

Transportation on Purchases. When the seller, such as a wholesaler or manufacturer, quotes a price on goods to the buyer, the price quotation usually specifies the free delivery point, called the *f.o.b.* point, beyond which the buyer must bear the transportation expenses. The initials f.o.b. stand for *free on board.* Free on board means that the seller delivers the goods upon their means of conveyance, free of loading and transportation charges, at the point designated in the quotation.

If the terms are f.o.b. the buyer's freight station, or *f.o.b. destination,* the seller bears the cost of the freight charges. If the terms are f.o.b. the seller's freight station, or *f.o.b. shipping point,* the buyer must bear the cost of the freight.

To illustrate: if the Anchor Oil Heater Company, Baltimore, quotes to R. S. Sager, Akron, a price of $495, f.o.b. Akron, for an oil heating unit, the company will pay the freight charges from Baltimore to the Akron freight depot. On the other hand, if the quoted price is $495, f.o.b. Baltimore, Sager will have to pay the freight charges.

Before placing an order for merchandise, the buyer often obtains price quotations from several wholesalers or manufacturers.

Upon comparing the quotations, the buyer should take into consideration the transportation costs as well as the prices quoted, unless the prices are f.o.b. the buyer's freight station.

Exercise 15. (*Written*)

1. J. S. Walker, retail furniture dealer at Salem, purchased 15 desks from Rand and Company, Chicago, at $72.50, less 25% and 20%, f.o.b. Chicago. Freight charges on the shipment amounted to $18.36. (a) What was Walker's gross cost of the 15 desks? (b) What was the average cost per desk?

2. The Rexford Men's Shop, at Milford, ordered 2 dozen men's shirts from the Wearwell Shirt Company, New York, quoted at $28 a dozen, less 20% and 10%, f.o.b. New York. The company prepaid the parcel-post charges on the shipment, 45¢, and added that amount on the invoice. (a) What was the gross cost of the order? (b) What was the average gross cost of each shirt?

3. As buyer for Storm and Company, Cleveland, Ohio, you can buy 24 quartered-oak office chairs from a local manufacturer at $12.50, less 10%. You can buy similar chairs from a Toledo factory at $12.00, less 10% and 5%. However, there is a freight charge from Toledo of 81¢ on each chair. With which firm should you place the order?

4. A firm in Sacramento offers you an invoice of merchandise for $630, less 30% and 20%, f.o.b. your city. Another company in San Francisco offers similar merchandise at the same list price less 25%, 20%, and 10%, f.o.b. San Francisco. The freight charges from San Francisco to your city are $17.30. (a) How much is saved by taking advantage of the better offer? (b) Find a single discount equivalent to the series offered by the company in San Francisco.

5. The buyer for the Samson Department Store finds that he can purchase a certain article from four different manufacturers in various sections of the country. He constructs the following schedule of the comparative cost of each manufacturer's product:

Manufacturer	List Price of Article	Discounts	Invoice Price of Article	Freight	Gross Cost of Article
A	$76.49	10%, 10%	?	$3.47	?
B	87.61	15%, 10%, 10%	?	2.90	?
C	79.50	15%, 5%	?	3.75	?
D	69.40	5%	?	4.15	?

You are to determine: (a) the invoice price of the article of each manufacturer, and (b) the gross cost of the article of each manufacturer. (c) If the quality of the article is approximately the same for all manufacturers, from which manufacturer should the article be purchased?

Problems for Application and Review

1. (a) Divide 40 by $3\frac{1}{2}$. (b) Find to the nearest cent $166\frac{2}{3}\%$ of \$70. (c) Express a tax rate of \$9.75 on \$1,000 as a rate in mills on \$1. (d) Find the interest at 6% on \$740 for 85 days.

2. What single rate of discount is equivalent to the series 30% and 15%?

3. A firm in Boston offers you an invoice of merchandise for \$480, less 20%, 10%, and 10%, f.o.b. your city. A company in Chicago offers similar merchandise at \$500, less 25% and 20%, f.o.b. Chicago. The freight charges from Chicago to your city are \$18.75. (a) Find the single discount equivalent to the trade discount series offered by the company in Boston. (b) How much is saved by taking advantage of the better offer?

4. A studio couch listed at \$80 is sold for \$72. What rate of discount is allowed?

5. The records of Nash's Variety Store show the following for the first half of the year: merchandise inventory, January 1, \$14,150, merchandise inventory June 30, \$12,810; net purchases, \$37,335; net sales, \$59,480; operating expenses, \$16,165. Find (a) the cost of goods sold for the period and (b) the net profit.

Cumulative Review

1. A man works daily from 8:00 a.m. to 4:30 p.m. with 30 minutes out for lunch, except on Saturday when he quits at 12 noon. He is paid time and a half for overtime each day during the period Monday through Friday and for all hours that he works on Saturday. (a) What did he earn last week at $\$1.37\frac{1}{2}$ per hour if he worked full time except for $2\frac{1}{2}$ hours lost on Tuesday? (b) What was the amount of his pay check if his employer deducted \$13.60 for the withholding tax and $1\frac{1}{2}\%$ for social security?

2. A savings bank pays interest on its deposits at the rate of 2% a year and adds interest to the balance on the first of January, April, July, and October. On April 1, 1954, Roy Walker deposited $750. On July 1, 1954, he deposited $325. On October 1 he withdrew $180. He closed the account on July 1, 1955. (a) How much did the bank pay Mr. Walker on July 1, 1955? (b) What was the total interest he received on his deposits?

3. A. H. Williamson, on retiring from business, invested a portion of his money as follows: $27,500 in $5\frac{1}{2}$% bonds at $137\frac{1}{2}$ and $25,000 in 4% bonds at 125, brokerage included in each case in the purchase price. (a) What was Williamson's total annual income from these bonds? (b) What rate per cent of income did Williamson receive on each investment?

4. J. C. Case placed $7,500 with his broker for investment. (a) How many Transcontinental Utilities $500 bonds can the broker buy for him at $78\frac{3}{4}$ if $1.25 is charged for brokerage on each bond? (b) What will be the total cost of the bonds? (c) What will be the unexpended balance?

5. The asking price of a house that rents for $110 a month is $11,200; terms, $4,000 mortgage at 5%, the balance in cash. Annual expenses, in addition to interest on the mortgage, are estimated at $665. What is the highest price a prospective buyer can afford to offer for the property if he desires a net return of 7% on his investment?

6. A man pays $85 a month rent for a house that he can buy for $9,000. How much would he save in a year by buying the house if the annual expenses are estimated at $635 and money is worth 3%?

7. Johnson and Adams insured their houses for equal amounts. Johnson paid $55 for three years. Adams paid $22 annually for three years. How much would Adams have saved if he had taken advantage of the three-year rate?

8. J. L. Oliver used 30 gallons of gasoline on a trip of 440 miles. (a) How many miles did he average per gallon, to the nearest tenth of a mile? (b) What was the total cost of the gasoline at 29.7¢ a gallon? (c) What was the expense per mile for the gasoline, computed to the nearest tenth of a cent?

9. When buying a new car costing $2,400, Fisher turned in his old car and received a trade-in allowance of $900. The carrying charge was 8% of the unpaid balance. The unpaid balance and carrying charge was paid by Fisher in 12 equal monthly installments. How much money did he pay in each installment?

Section 6 . . . Cash Discount

Meaning of Cash Discount. It is the custom of most wholesalers and manufacturers who sell on account to offer the customer a deduction from the invoice price for early payment of an invoice. This deduction, which is allowed for early payment, is called a *cash discount.*

The cash discount is expressed as a per cent of the invoice price and is included, in abbreviated form, in the terms of the invoice. Examples of such terms and their meanings are the following:

Terms	Meaning of the Terms
2/10, n/30	A discount of 2% may be deducted if payment is made within 10 days from the date of the invoice; otherwise the full invoice price is due for payment within 30 days from the date of the invoice.
2/10, 1/30, n/60	A discount of 2% may be deducted if payment is made within 10 days from the date of the invoice; or a discount of 1% may be deducted if payment is made within 30 days from the date of the invoice; otherwise the full invoice price is due for payment within 60 days from the date of the invoice.

In the expression "2/10," for example, the 2 indicates the rate of cash discount, 2%. The 10 indicates the number of days in the *discount period,* 10 days.

Both the discount period and the credit period are measured from the date of the invoice.

> If the terms of an invoice dated May 1 are 2/10, n/30, the last date on which advantage may be taken of the discount is May 1 + 10 days, or May 11. If advantage is not taken of the cash discount, payment of the full invoice price is due on May 1 + 30 days, or May 31.

Exercise 16. (*Oral*)

1. State the last date on which the cash discount may be taken in each of the following:

Date of Invoice	Terms	Date of Invoice	Terms
a. July 18	2/10, n/30	d. June 23	2/10, n/60
b. July 31	3/10, n/30	e. Jan. 26	3/15, n/60
c. April 20	3/15, n/60	f. Oct. 18	2/30, n/60

2. State what rate of cash discount, if any, may be deducted in each of the following:

	Date of Invoice	Terms	Date Paid
a.	Aug. 27	1/10, n/30	Sept. 6
b.	Mar. 20	3/15, n/60	April 3
c.	May 22	3/10, n/90	June 2
d.	Nov. 16	2/30, n/60	Dec. 15
e.	Jan. 7	2/10, 1/30, n/60	Jan. 25
f.	Feb. 28	3/10, 2/30, n/60	Mar. 9
g.	Oct. 15	3/5, 2/20, n/60	Nov. 10
h.	Sept. 1	3/10, 1/30, n/60	Oct. 1

To Find the Cash Discount and the Cash Price. When payment of an invoice is made within the discount period, the amount the buyer pays is the invoice price less the cash discount. This amount may be referred to as the *cash price* of the merchandise, or invoice.

The per cent representing the rate of cash discount is always based on the *invoice price.* Since the invoice price is the base, it is multiplied by the per cent, or rate of discount, to find the amount of the cash discount.

Rate of Cash Discount × Invoice Price = Cash Discount

Since the cash discount is a deduction from the invoice price, it is subtracted from the invoice price to find the cash price.

Invoice Price − Cash Discount = Cash Price

Cash discount is always computed on the invoice price. If both a trade discount and a cash discount are allowed on a purchase, the trade discount is first subtracted to find the amount of the invoice price. The cash discount is then calculated on the invoice price.

Exercise 17. (*Written*)

1. An invoice of goods amounting to $725 was dated December 15. If the terms were 3/10, 2/30, n/60, what amount would be required to pay for the goods on January 10?

2. What will be the amount of the check sent in payment of an invoice amounting to $1,150; terms 5/10, 2/30, n/60; dated May 5, and paid May 15?

3. A retailer purchased goods on January 25 for $1,343.20; terms, 3/10, 2/30, n/90. The bill was paid on February 23. How much more would have been saved if the invoice had been paid on February 3?

4. J. A. Fisher purchased goods amounting to $1,500, less 20% and 10%, on terms 1/10, n/30. The invoice was dated April 3. (a) If he paid the invoice on April 13, what amount of cash was required for making the payment? (b) How much did he save by paying the invoice on April 13?

5. A retailer purchased an invoice of goods amounting to $5,600 with trade discounts of 10% and 5%. The seller offered him 60 days credit or a cash discount of 3% for immediate payment. Not having the ready cash, he accepted the credit terms. (a) How much did he actually pay for the goods? (b) How much would he have saved if he had had sufficient cash to make immediate payment?

Borrowing to Take Advantage of a Cash Discount. If the purchaser does not have the cash needed for settling an invoice within the discount period, it will usually pay him to borrow the money and take advantage of the cash discount. The amount he saves is the amount of the cash discount less the cost of the interest on the amount borrowed.

Cash Discount − Cost of Interest = Amount Saved

Example: On April 8, Ralph Wood purchased merchandise invoiced at $1,500 with terms of 2/10, n/30. In order to pay the bill on April 18 and take advantage of the 2% discount, he had to borrow the money at his bank, giving his 20-day note with interest at 6%. How much did he save by borrowing to take advantage of the discount?

Solution:

Invoice price $1,500.00
Cash discount 30.00 (2% of $1,500)
Cash price $1,470.00, the amount borrowed
Interest on $1,470.00 for 20 days at 6% = $4.90
$30.00 cash discount
4.90 cost of interest
$25.10 amount saved by borrowing to take advantage of the discount. Ans.

Exercise 18. (*Written*)

1. On March 15, F. B. Graves purchased merchandise invoiced at $750 with terms of 2/10, n/30. In order to pay for the goods on March 25 and take advantage of the cash discount, Graves had to borrow the money at his bank, giving his 20-day note with interest at 6%. (a) What was the amount of the cash discount? (b) What amount did Graves borrow at the bank? (c) What was the cost of the interest on the amount borrowed? (d) How much did Graves save by borrowing the money and taking advantage of the cash discount?

2. On August 7, a retail dealer purchased an invoice of merchandise amounting to $450 with terms of 2/10, n/60. In order to pay the bill on August 17 and take advantage of the cash discount, he borrowed the money at 6% for 50 days. (a) What was the amount of the cash discount? (b) What amount did he borrow? (c) What was the cost of the interest on the amount borrowed? (d) How much did he save by borrowing to take advantage of the discount?

3. In order to take advantage of the cash discount on a bill of goods, dated June 12, amounting to $900, with terms of 3/10, n/90, G. F. Eldred borrowed enough money to pay the bill on June 22, giving his 80-day note at 6%. How much did he save?

4. The Standard Furniture Company purchased a quantity of furniture amounting to $2,000 on terms of 2/10, n/60. In order to take advantage of the cash discount, the company borrowed the money for 50 days at 6% and paid the bill. How much did the company gain by borrowing the money?

5. A dealer buys goods on terms of 2% discount for immediate payment, net 30 days. On an invoice amounting to $480, how much would be saved by borrowing the money at 6% for 30 days in order to take advantage of the cash discount?

Exercise 19. (*Written*)

1. On May 1, Frank Kirby purchases a bill of goods amounting to $660 on terms of 2/10, n/30. How much will he save by borrowing the money at 6% on May 11 and taking advantage of the discount?

In a problem of this type, it is to be assumed that the loan would be repaid on the same day as the due date of the invoice. Since

Kirby purchases the merchandise in expectation of being able to pay for it on May 31, the due date of the invoice, he would likewise borrow the money in expectation of being able to repay the loan on May 31. In solving the problem it is therefore assumed that he would borrow the money on May 11 for 20 days, the time from May 11 to May 31.

2. On January 14, a retailer purchased a bill of goods amounting to $900 with terms of 2/10, n/60. Not having the ready cash, he borrowed the money at 6% on January 24 in order to pay the bill on that date and take advantage of the cash discount. (a) What amount did he borrow? (b) For how long did he borrow it? (c) How much did he save by borrowing to take advantage of the discount?

3. On an invoice amounting to $1,200 the terms are 3/10, n/90. How much would the purchaser save by borrowing the money at 6% in order to take advantage of the cash discount?

It is to be assumed that the money would be borrowed and the invoice paid on the last day of the discount period. The time for which the money would be borrowed would be the time from the last day of the discount period to the last day of the credit period. This time may be found by subtracting the time in the discount period from the time in the credit period. In the foregoing problem this time would be 90 days – 10 days, or 80 days. The time for which the money would be borrowed is therefore 80 days.

4. On an invoice amounting to $800 the terms are 2/15, n/60. How much would the purchaser save by borrowing the money at 6% in order to take advantage of the discount?

5. On an invoice of goods amounting to $1,400 you are offered 90 days' credit or a 5% discount for cash (immediate payment). How much would you save by borrowing the money at 6% and taking advantage of the cash terms?

Since payment must be made on the date of purchase, or date of invoice, in order to obtain the benefit of the cash discount, the money would be borrowed for the entire credit period, 90 days.

To Find the Rate of Cash Discount. The rate of cash discount is always based on the invoice price. Therefore the rate may be found by dividing the amount of the cash discount by the invoice price.

$$\text{Rate of Cash Discount} = \frac{\text{Cash Discount}}{\text{Invoice Price}}$$

Exercise 20. (*Written*)

1. An invoice of hardware amounting to $250 is settled within the discount period by a cash payment of $245. (a) What is the amount of the cash discount? (b) The cash discount is what per cent of the invoice price?

2. A check for $436.50 is drawn within the discount period in payment of an invoice amounting to $450. What rate of cash discount is allowed?

3. By paying cash, $114, a retailer saves $6 on an invoice of sporting goods. (a) What is the invoice price of the goods? (b) What is the rate of cash discount?

4. A retailer saves $5 by accepting the cash discount terms and paying an invoice within the discount period. If the amount he pays is $195, what rate of cash discount is allowed?

5. The price of coal is $22.50 a ton; terms net 30 days, with a discount of 90¢ a ton for immediate payment. What per cent would G. A. Woodin save by paying immediately?

To Find the Invoice Price When the Cash Discount and Rate of Cash Discount Are Known. When the cash discount and rate of cash discount are known, and it is desired to find the invoice price, the problem is one in finding the number on which the rate is based.

Example: By taking a cash discount of 2% on a bill of goods, a dealer saved $8. What was the invoice price of the merchandise?

Analysis: The per cent given in the problem is based on the invoice price, which is unknown. The problem tells us, however, that 2% of the invoice price is equal to $8.

$$2\% \times \text{Invoice Price} = \$8$$

As you have learned in a preceding section, the unknown factor of a product can be found by dividing the product by the known factor. Hence, the value of the unknown factor, Invoice Price, may be found by dividing $8 by 2%.

Solution:

$$\begin{aligned} 2\% \times \textit{Invoice Price} &= \$8 \\ \textit{Invoice Price} &= \$8 \div 2\% \\ &= \$8 \div .02 = \$400 \quad \textit{Ans.} \end{aligned}$$

Proof:

$$\text{Rate of Cash Discount} \times \text{Invoice Price} = \text{Cash Discount}$$

$$2\% \times \$400 = \$8$$

Exercise 21. (*Written*)

1. The cash discount on an invoice of goods is $13.50. (a) If the rate of discount is 3%, what is the invoice price of the goods? (b) What is the cash price?

2. By taking the 2% cash discount offered on a bill of goods, a retail merchant saved $6.34. (a) What was the invoice price of the goods? (b) What was the amount of the check that he drew in payment of the invoice?

3. If a merchant saved $7.92 by taking a cash discount of 1½%, what was the amount of the invoice before the discount was deducted?

4. By taking a cash discount of 5% on a bill of goods, a merchant saved $23.41. Find the face of the bill before the discount was taken.

5. If $46.88 was saved by taking the 2½% cash discount offered on an invoice of merchandise, what was the amount of the invoice?

To Find the Invoice Price When the Cash Price and Rate of Cash Discount Are Known. If the cash price and rate of cash discount are known, and it is desired to find the invoice price, the problem is one in finding the value of an unknown number when an amount that is a given per cent less than the number is known.

Example: After deducting 2% cash discount, the cash price of a bill of goods is $392. What is the invoice price?

Analysis: The per cent given in the problem is based on the invoice price, which is unknown. The problem tells us, however, that if 2% of the invoice price is subtracted from the invoice price, the remainder is $392.

Invoice Price − 2% of Invoice Price = $392

Since the per cent is based on the invoice price, the invoice price is the base, or whole, and is therefore 100% of itself.

Solution:

$$\begin{array}{rcrcl}
100\% & \times & \textit{Invoice Price} & = & \textit{Invoice Price} \\
\underline{-2\%} & \times & \textit{Invoice Price} & = & \underline{\textit{Cash Discount}} \\
98\% & \times & \textit{Invoice Price} & = & \textit{Cash Price} = \$392 \\
 & & \textit{Invoice Price} & = & \$392 \div 98\% \\
 & & & = & \$392 \div .98 = \$400 \textit{ Ans.}
\end{array}$$

Proof: Invoice Price − Cash Discount = Cash Price

$400 − 2% of $400 = $400 − $8 = $392

Exercise 22. (Written)

1. On an invoice of men's shirts and handkerchiefs, the terms are 3/10, n/60. (a) The cash discount is what per cent of the invoice price? (b) The cash price is what per cent of the invoice price?

2. If the cash discount offered on a bill of goods is $1\frac{1}{2}\%$ of the invoice price, what per cent of the invoice price is the cash price?

3. For paying an invoice immediately, a merchant is allowed a cash discount of 2%. The amount of the merchant's payment is what per cent of the amount of the invoice?

4. By paying an invoice within the discount period to take advantage of a cash discount of 5%, a merchant settled the invoice with a cash payment of $817. What was the amount of the invoice?

5. If $2,415.60 represents the amount of an invoice less 1%, what was the amount of the invoice?

Problems for Application and Review

Group A

1. (a) Divide $16\frac{1}{2}$ by $1\frac{3}{8}$. (b) What part greater than $3.00 is $4.80? (c) Find to the nearest cent $133\frac{1}{3}\%$ of $23. (d) $1.25 is what part smaller than $2.00? (e) $16.25 is 130% of what amount? (f) Find the interest at 6% on $225 for 91 days.

2. A merchant bought goods invoiced at $1,860, terms 3/10, n/90. He did not have the money to pay the bill but wished to take advantage of the discount. How much did he save by borrowing the necessary amount of money for 80 days at 6%?

3. A dealer receives an invoice for $400, terms 2/10, n/30. Find the net amount of the invoice if paid within 10 days.

4. One dealer offers an oriental rug for $950, less $33\frac{1}{3}\%$ and 20%. Another dealer offers a rug of equal value for $1,050, less $37\frac{1}{2}\%$, 15%, and 10%. Which is the better offer and how much better?

5. What single rate of discount is equivalent to the series 20% and 15%?

Group B

1. (a) Multiply 27 by $2\frac{3}{4}$. (b) Divide $37\frac{1}{2}$ by $1\frac{7}{8}$. (c) What amount is 110% greater than $8.50? (d) Find the number of days from May 8 to October 3. (e) Express 8½ mills as a decimal part of $1. (f) Find the interest on $365 for 93 days at 6%.

2. By taking a cash discount of 2% on an invoice, a merchant saved $14.87. What was the invoice price of the merchandise?

3. The price of coal is $18.75 a ton, and customers are given 75¢ off the price of each ton if cash payment is made. What per cent would Jones save by paying cash?

4. A dealer buys goods on terms of 2% cash, net 30 days. On an invoice amounting to $300, how much would be saved by borrowing money at 6% for 30 days in order to take advantage of the cash discount?

5. A retailer receives an invoice for $350, terms 3/10, n/30. Find the net amount of the invoice if paid within 10 days.

6. What single discount equals the series 25% and 10%?

Group C

1. (a) .97 times what amount equals $814.80? (b) Multiply 28½ by 22¾. (c) Find to the nearest cent 137½% of $3. (d) Express a tax rate of 42 mills on $1 as a rate on $1,000. (e) Find the interest at 6% on $730 for 95 days.

2. The 2% cash discount on an invoice of merchandise is $32.88. What is the cash price of the merchandise?

3. If a merchant saved $36 by taking a cash discount of 1½%, what was the invoice price of the merchandise he purchased?

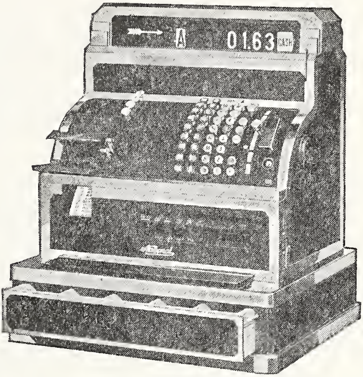
4. John Harper bought an invoice of goods for $3,650, less 10% and 5%, on terms 2/10, n/60. In order to take advantage of the cash discount, Harper borrowed the sum needed from Smith, agreeing to repay him in 50 days with 6% interest. How much did Harper gain by borrowing the money?

5. How much will a hardware dealer pay if he takes advantage of the discount on an invoice for $500, terms 3/10, n/30?

6. The Acme Machine Company offered to sell Henry Adams a power saw for $300, less 20%, 10%, and 10%. The Federal Machine Company quoted a similar saw at $325, less 35% and 10%. (a) Find the single discount equivalent to each of the two series of discounts. (b) Which is the better offer? (c) How much better?

Section 7 . . . Sales and Sales Records

Cash Register. To manage a retail business efficiently, the proprietor must have a complete record of all sales transactions. For this purpose, most stores use the *cash register* to provide a record of the cash sales and also a record of cash received and paid out. Small stores ordinarily have one register. Large stores usually have at least one register for each sales department.



Cash Register

All registers provide a complete record of the cash sales and a convenient system for safeguarding money. The more complete registers also provide a record of charge sales, money received from charge customers on account, money paid out, and the salesperson handling the transaction.

The register is operated whenever cash is received or a sale is made and whenever cash is paid out. Each time the register is operated, the nature and amount of the transaction is automatically printed on a paper tape called a *detailed audit strip,* located within the machine. The register is equipped with a device whereby the total of each type of transaction is automatically printed on the detailed audit strip at the end of the day.

Proving the Cash. At the end of each day, a permanent record is made of the cash register totals, and a count is made of the cash in the cash register money drawer. The cash on hand in the money drawer should be the same as the amount representing the difference between the cash register record of total cash received and the total "paid outs." If it is not, the cash is *short* if it is less than that amount, and *over* if it is more than that amount.

Example: James King's cash register readings at the end of the day on July 1 showed total cash received, $153.90, and total cash paid out, $2.10. The cash on hand in the money drawer at the end of the day was $151.45. Prepare a statement of the proof of the cash, showing the cash over or short, if any.

Solution:

Cash Proof, July 1, 19--

Register total of cash received	*$153.90*
Register total of cash paid out	*2.10*
Remainder to be accounted for	*$151.80*
Cash on hand in money drawer	*$151.45*
Cash short	*$ .35*

In the foregoing example, the cash is *short* 35¢ because the cash on hand in the money drawer, $151.45, is 35¢ less than the amount to be accounted for, $151.80. If the cash on hand had been 35¢ more than the amount to be accounted for, the cash would have been *over* 35¢.

If the cash in the money drawer at the end of the day includes a change fund placed in the drawer at the beginning of the day, the amount of the fund should be included in computing the amount to be accounted for, as indicated in the cash proof given below.

Cash Proof, April 12, 19--

Change fund	$ 25.00	
Register total of cash received	242.60	$267.60
Register total of cash paid out		4.15
Remainder to be accounted for		$263.45
Cash on hand in money drawer		$263.15
Cash short		$ .30

Exercise 23. (*Written*)

1. At the beginning of the day, March 6, J. H. Madison placed $25 in change in the money drawer of his cash register. The cash register readings at the end of the day showed total cash received, $274.13, and total cash paid out, $8.54. The cash on hand in the money drawer at the end of the day was $290.74. Prepare a statement of the proof of the cash, showing the cash over or short.

2. On the morning of December 28, A. M. Stone placed $20 in change in the money drawer of his cash register. At the end of the day, the cash register record showed that $203.09 had been taken in, that $4.77 had been paid out in cash refunds, and that Mr. Stone had taken out $5 for his personal use. The amount of cash on hand in the money drawer at the end of the day was $213.52. (a) Is this the amount that should have been on hand? (b) If not, how much was it short or over?

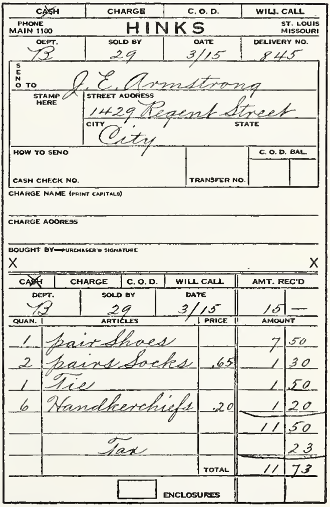
3. The cashier at the Boulevard Cafeteria started the day with $75 in change. At 2:00 p.m., when she went off duty, she sorted her counter checks and found that she had the following:

22 for 35¢	24 for 50¢	160 for 65¢	70 for 80¢
28 " 40¢	40 " 55¢	212 " 70¢	60 " 85¢
30 " 45¢	92 " 60¢	120 " 75¢	18 " 90¢

She counted her cash in the money drawer and found that she had $661.40. (a) Assuming that she had made no payments from the money drawer, is this the amount she should have had? (b) If not, how much was she over or short?

Sales Ticket and Credit Slip. Although the cash register performs valuable, needed service, most types do not provide the variety of essential information that can be recorded on a sales ticket. For example, it is frequently necessary to have a record of the customer's name and address for purposes of bookkeeping, delivery, or advertising. Again, when a customer returns goods, it is advantageous to have a record of the exact items originally purchased. Sales tickets are used when the proprietor desires to have this information.

Stores sometimes use the cash register to record cash sales and the sales ticket to record sales to charge customers. Very often, however, both cash and charge sales tickets are used. Illustrated at the left is a ticket for a cash sale.



[✓ CASH] CHARGE C. O. D. WILL CALL

PHONE MAIN 1100 HINKS ST. LOUIS MISSOURI

DEPT.	SOLD BY	DATE	DELIVERY NO.
B	29	3/15	845

SEND TO J. E. Armstrong

STAMP HERE

STREET ADDRESS 1429 Regent Street

CITY City STATE

HOW TO SEND

CASH CHECK NO. TRANSFER NO. C. O. D. BAL.

CHARGE NAME (PRINT CAPITALS)

CHARGE ADDRESS

BOUGHT BY—PURCHASER'S SIGNATURE

X X

[✓ CASH] CHARGE C. O. D. WILL CALL AMT. REC'D

DEPT.	SOLD BY	DATE	AMT. REC'D
B	29	3/15	15 —

QUAN.	ARTICLES	PRICE	AMOUNT
1	pair Shoes		7 50
2	pairs Socks	.65	1 30
1	Tie		1 50
6	Handkerchiefs	.20	1 20
			11 50
	Tax		23
		TOTAL	11 73

☐ ENCLOSURES

Sales Ticket for Cash Sale

When a customer returns goods or is granted an allowance, a credit slip, similar in form to a sales ticket, is made out to show the nature and amount of the return or allowance, and other miscellaneous information needed for bookkeeping purposes. In the case of a charge customer, the name and address of the customer is included on the credit slip.

Sales Records. Sales slips and credit slips are made out in duplicate by means of carbon paper. The carbon copy is given to the customer, and the original is retained by the store for use in compiling the sales records.

At the close of each day, the store's copies of the various sales tickets and credit slips are sorted and tabulated to find the total gross sales, the returns and allowances, and the net sales for the day. A permanent record of the totals for each day is made in a sales record book.

RECORD OF SALES

DATE	CASH SALES			CHARGE SALES			TOTAL NET SALES
	GROSS SALES	RET. & ALLOW.	NET SALES	GROSS SALES	RET. & ALLOW.	NET SALES	
19— June 1	261.48	.34	261.14	143.70	4.18	139.52	400.66
2	307.10	—	307.10	174.65	3.20	171.45	478.55

Sales Record Book

The sales data may also be classified and summarized daily, weekly, or monthly, etc., according to each kind of commodity, each department, each sales clerk, or in any other manner the proprietor desires.

Exercise 24. (*Written*)

1. A publisher sold the following books during one year:

Jan.	826	April	265	July	525	Oct.	1,960
Feb.	942	May	240	Aug.	1,518	Nov.	1,292
Mar.	538	June	216	Sept.	5,045	Dec.	3,541

(a) Find the total number of books sold during the year. (b) Find the average number of books sold per month. (c) During which months did the sales exceed the average?

2. The table below at the right shows the gross sales and sales returns for the four departments of Dawson's Clothing Store for January 28 of the current year.

Copy the table and show: (a) the net sales for each department, (b) the total gross sales, (c) the total sales returns, and (d) the total net sales. (e) Prove the total net sales by subtracting the total sales returns from the total gross sales.

DAILY SUMMARY--CASH SALES
JANUARY 28, 19--

DEPARTMENT	GROSS SALES	SALES RETURNS	NET SALES
Clothing	$3,842	$39	?
Hats	644	8	?
Shoes	761	12	?
Furnishings	903	15	?
Totals	?	?	?

3. The table below at the left shows the cash sales and charge sales for the six departments of the Clinton Hardware Store for February 2 of the current year.

Copy the table and show: (a) the total sales for each department, (b) the total cash sales, (c) the total charge sales, and (d) the total sales for the day. (e) Prove the total of the "Total Sales" column by adding the totals of the columns at the left.

DAILY SALES SUMMARY
FEBRUARY 2, 19--

DEPARTMENT	CASH SALES	CHARGE SALES	TOTAL SALES
Hardware	$92.10	$54.67	?
Cutlery	60.56	31.94	?
Furniture	75.47	59.23	?
Appliances	38.96	71.52	?
Accessories	46.34	61.96	?
Tools	41.43	49.07	?
Totals	?	?	?

Exercise 25. (*Written*)

1. For the month of January last year, the sales of Gilson's General Store were $3,000. For January of the current year the sales were $3,750. (a) What was the amount of the increase or decrease in sales? (b) What was the per cent of increase or decrease?

2. Find, to the nearest tenth per cent, the increase or decrease in sales for each of the two departments indicated below:

Department	Last Year	This Year	Per Cent Increase	Per Cent Decrease
Groceries	$34,600	$36,500	....	....
Meats	18,400	17,800	....	....

3. For each of the departments shown below, find the per cent increase or decrease in sales.

Department	This Year	Last Year	Per Cent Increase	Per Cent Decrease
Accessories	$15,500	$18,600	....	....
Tires	28,700	32,800	....	....

4. For the first week of the current year the sales of the Elm Farm Dairy were as follows: milk, $2,750; cream, $1,080. For the first week of last year the sales were: milk, $2,200; cream, $1,350. Find the per cent increase or decrease in the sales of each commodity.

5. A merchant's sales for January were $5,865, which was 15% less than his sales for December. What was the amount of his December sales?

6. A merchant's sales for April were $2,346, which was 15% more than his sales for March. What was the amount of his March sales?

Problems for Application and Review

1. (a) Multiply $24\frac{2}{3}$ by $18\frac{3}{4}$. (b) Divide 30 by $2\frac{1}{4}$. (c) What per cent of $4.50 is $6.00? (d) Divide $23\frac{1}{3}$ by $1\frac{5}{9}$. (e) Express a tax rate of $8.25 on $1,000 as a rate in mills on $1. (f) Find the interest at 6% on $355 for 101 days.

2. On the morning of June 5, T. E. Little placed $50 in change in the money drawer of his cash register. The cash register readings at the end of the day showed total cash received, $387.42, and total cash paid out, $12.77. The cash on hand in the money drawer at the end of the day was $425.15. (a) Was the cash short or over? (b) How much short or over?

3. The cash price of an invoice, after deducting 4% discount, is $216. What is the invoice price?

4. If the 3% cash discount on a merchandise invoice amounts to $29.25, what is the cash price of the merchandise?

5. Find the single discount that is equivalent to a series of discounts of 20% and 5%.

6. A dining-room suite listed at $180 is billed at $157.50. What rate of discount is allowed?

Section 8 . . . Retail Discount

Marked Price, Discount, and Selling Price. The price at which a store owner offers to sell an article is referred to as the *marked price.* This price is usually written on the article itself, on a price tag or ticket attached to the article, or on the container in which the article is stored.

To keep goods moving, the prices of some articles have to be reduced. The style may have suddenly changed, too large a supply may have been purchased, or the original price may have been set too high. In any case, the demand at the original price is not sufficient to move the article as rapidly as desired. Therefore a price reduction is made. The amount by which the marked price is reduced is referred to as a *discount* or *markdown.*

The price that the customer actually pays for an article is called the *selling price,* or *sales price.* If a discount, or markdown, has been allowed, the discount is equal to the marked price less the selling price.

$$\text{Marked Price} - \text{Selling Price} = \text{Discount}$$

Similarly, the selling price is equal to the marked price less the discount.

$$\text{Marked Price} - \text{Discount} = \text{Selling Price}$$

In cases where no discount or markdown is offered, the selling price of the article is the same amount as the marked price.

To Find the Rate of Discount. The discount, or markdown, offered by a retailer is often expressed as a per cent. This per cent is always based on the marked price. The rate of discount is therefore found by dividing the discount by the marked price.

$$\text{Rate of Discount} = \frac{\text{Discount}}{\text{Marked Price}}$$

Exercise 26. (*Written*)

1. During a special January sale, a leather handbag originally priced at $22 is sold for $16.50. (a) What retail discount is allowed? (b) What is the rate of discount?

2. At the end of the season, an overcoat priced at $50 was marked down to $42.50. What was the per cent markdown?

3. During an anniversary sale at the Gimbel Store, the price of a chair that regularly sells for $45 was reduced to $27.50. At what rate, to the nearest tenth per cent, was the price reduced?

4. A raincoat that had been marked $22 was sold during a special sale for $19.25. What per cent discount, to the nearest tenth per cent, was allowed?

5. In the window of a dress shop, a dress is marked "$30.75—Formerly $37.50." At what rate was the price reduced?

6. Walter Larson purchased a suit of clothes at the Melton Clothing Store for $48.50. The clerk threw in, without charge, a belt worth $1.50. To what rate of discount was this equivalent?

Exercise 27. (*Written*)

1. Men's shirts regularly priced at $2.75 each are sold during a special sale at 2 for $4.95. (a) How much does a customer save by buying two shirts at the sale price? (b) What per cent does he save?

2. Wash ties that regularly sell at 55¢ each are offered at the special price of 3 for $1.10. What rate of discount is offered?

3. The subscription price of the *Holiday* magazine is $5 for one year. A 2-year subscription is offered for $8 and a 3-year subscription for $11. (a) What rate of discount is offered on the purchase of a 2-year subscription? (b) Of a 3-year subscription?

4. The railroad fare one way between two cities is $24.50. A round-trip ticket costs $41.65. What per cent discount is obtained by the traveler who purchases a round-trip ticket?

5. The Liggett Store has tooth powder which it sells regularly at 25¢ a can. During its annual "One Cent Sale" the store offers to sell 2 cans for the price of one plus 1¢. This is equivalent to what rate of discount?

To Find the Discount and the Selling Price When the Marked Price and Rate of Discount Are Known. The per cent representing the rate of discount, or rate of markdown, is always based on the marked price. Since the marked price is the base, it is multiplied by the per cent, or rate of discount, to find the amount of the discount.

Rate of Discount × Marked Price = Discount

The amount of the discount is then subtracted from the marked price to find the selling price.

Exercise 28. (*Written*)

1. Suits marked $30 were sold for clearance at 15% discount. (a) What was the amount of the discount on one suit? (b) What was the selling price of the suit?

2. How much does the customer pay for a pair of gloves marked $4.75 if a retail discount of 16% is allowed?

3. Shoes formerly priced at $12.50 a pair were marked down 22%. What was the mark-down price per pair?

4. The price of a dictionary is reduced 40% from the original price of $3.95. How much will the dictionary cost the purchaser at the reduced price?

5. During a special sale, the price of a vacuum cleaner was marked down 20% from $59.50. What is the special sale price?

To Find the Marked Price When the Selling Price and Rate of Discount Are Known. If the selling price and the rate of discount are known, and it is desired to find the marked price, the problem is one in finding the value of an unknown number when an amount that is a given per cent less than the number is known.

Example: A jeweler sold a wrist watch to a customer for $27 after deducting a discount of 10% from the marked price. What was the marked price of the watch?

Analysis: The per cent given in the problem is based on the marked price, which is unknown. The problem tells us, however, that if 10% of the marked price is subtracted from the marked price, the remainder is $27.

Marked Price − 10% of Marked Price = $27

Since the per cent is based on the marked price, the marked price is the base, or whole, and is therefore 100% of itself.

Solution:

$$\begin{array}{rrcl} 100\% & \times \text{ Marked Price} & = & \text{Marked Price} \\ \underline{-10\%} & \times \text{ Marked Price} & = & \underline{\text{Discount}} \\ 90\% & \times \text{ Marked Price} & = & \text{Selling Price} = \$27 \\ & \text{Marked Price} & = & \$27 \div 90\% \\ & & = & \$27 \div .9 = \$30 \quad \text{Ans.} \end{array}$$

Proof: Marked Price − Discount = Selling Price

$30 − 10% of $30 = $30 − $3 = $27

Exercise 29. (Written)

1. During a mark-down sale, a department store sold a radio at a discount of 15% from the marked price. The selling price was what per cent of the marked price?

2. The Melrose Luggage Shop sells a traveling bag to a customer for $21, which is 16% less than the marked price. (a) The selling price is what per cent of the marked price? (b) How much is the marked price?

3. An electric range is sold for $154, which is 12% under the marked price. (a) What per cent of the marked price is the selling price? (b) How much is the marked price?

4. After allowing a retail discount of $12\frac{1}{2}\%$, a shoe dealer sold a pair of shoes for $7.45. What was the marked price?

5. At what price should the Home Furniture Store mark a floor rug in order that the selling price may be $56.25 after allowing an advertised discount of 25% on the marked price?

Problems for Application and Review

1. (a) Find the sum of $9\frac{2}{3}$, $12\frac{3}{4}$, and $15\frac{5}{6}$. (b) What number divided by $8\frac{2}{3}$ gives $15\frac{3}{4}$? (c) What amount increased by $\frac{3}{8}$ of itself equals $26.40? (d) $40.15 is what per cent smaller than $55? (e) Find the interest on $175 for 103 days at 6%.

2. A bedroom set that had been selling at $300 was offered during a special sale for $250. What rate of discount was allowed?

3. The cash price of an invoice, after deducting 2% discount, is $740.39. What is the invoice price?

4. What is the cash price of an invoice of goods if the $1\frac{1}{2}\%$ cash discount amounts to $2.97?

5. By taking a cash discount of $2\frac{1}{2}\%$ on an invoice a merchant saved $86.43. What was the original amount of the invoice?

6. What will be the amount of the check sent in payment of an invoice amounting to $660, terms 3/10, 1/20, n/30, dated April 27, and paid on May 15?

7. A drop in the price of sugar has been announced from 9 to 8.9 cents a pound, less the usual discount of 2% in each case. How much will one save on a purchase of 500,000 pounds?

Cumulative Review

1. Brown & Company's bank statement for July showed the following: balance July 1, \$8,453.21. Deposits: July 10, \$643.50; July 17, \$287.43; July 24, \$59. Checks paid: July 3, \$75.46; July 6, \$187.45; July 13, \$587.23; July 20, \$1,467.50; July 28, \$627. Balance July 31, \$6,498.50. The checkbook balance was \$5,262.25. The bookkeeper, when checking the checkbook stubs, found that the check for \$627 had been entered as \$772, and checks for \$48 and \$1,043.25 had not been paid. Prepare a reconciliation statement.

2. Dorr, a buyer of used cars, receives a monthly salary of \$300 and a 3% commission on all cars bought. In addition, he receives a commission of 1½% on purchases in excess of \$8,000 a month. His purchases of used cars amounted to \$7,800 in April and to \$9,240 in May. (a) Find Dorr's total commission for the two months. (b) Find his average monthly income for the two months.

3. A real estate agent sold a house and, after deducting 5% commission, remitted \$9,120 to the former owner. What was the selling price of the house?

4. A 5% mortgage for \$6,000, dated April 1, requires the quarterly payment of interest together with a payment of \$100 on the principal. What will be the amount of the quarterly payment due at the end of the second year, counted from the date of the mortgage?

5. The advertised cash price of an electric washing machine is \$145. When it is bought on the installment plan a down payment of \$15 is required. (a) What is the unpaid balance? (b) To the unpaid balance a carrying charge of 8% of that amount is added. What is the carrying charge? (c) If the combined total of the unpaid balance plus the carrying charge is to be paid in eight equal monthly installments, what payment is made each month?

6. An investor pays \$80 for a \$100 bond bearing interest at 5%. What will be the rate of income on his investment?

7. Yale Stamping Company 4% bonds with a par value of \$100 may be purchased at \$110, including brokerage. How much money must be invested in the bonds to produce an annual income of \$100?

8. Gray purchased ten \$1,000 bonds, bearing 5% interest, at \$945 each, brokerage \$2.50 a bond, and 40 shares of Webster Milling stock at 42, plus \$16.56 for brokerage and \$2.40 for taxes. The stock pays a quarterly dividend of 25¢ a share. (a) Find the total cost of the bonds and the stock. (b) Find Gray's total annual income from these investments. (c) Find the rate of income to the nearest tenth per cent.

9. G. R. Loft owned 300 shares of Gulf State Sulphur stock. He authorized his broker to sell the stock at $57\frac{1}{2}$ and buy Southern Pacific $4\frac{1}{2}\%$, $1,000 bonds at $94\frac{1}{2}$. The brokerage and taxes on the sale of the stock amounted to $125.61, and the brokerage for buying the bonds was $2.50 per bond. (a) What were the proceeds from the sale of the stock? (b) How many bonds were purchased? (c) What was the unexpended balance?

10. A man buys a house for $7,000. He spends $1,175 in permanent additions and insures the house for $6,500 at 70¢ per hundred dollars for three years. He estimates taxes, repairs, depreciation, etc., at $490 a year. What is the lowest monthly rent that he can charge if he is to net 7% per annum on his investment?

11. A. B. Henry, a druggist, owns a stock of goods inventoried at $4,525 and a building valued at $15,000. He insures the stock for the inventoried value at $12.50 a thousand for one year and the building for 80% of its value at $17.10 a thousand for three years. Find the total yearly cost of insurance.

12. A residence valued at $9,000 was insured for $6,000 under a policy with an 80% coinsurance clause. A fire caused a loss of $3,600. (a) How much did the insurance company pay? (b) What per cent of the fire loss was borne by the owner? (c) The 3-year premium rate was 55¢ per $100. If the insurance was carried for 15 years, what was the total amount of premium paid?

13. Brown's electric bill showed meter readings of 1,232 K.W.H. on February 5 and 1,484 K.W.H. on March 5. His rate schedule listed the first 12 K.W.H. or less for $1, the next 30 K.W.H. at 5.5¢ per K.W.H., the next 58 K.W.H. at 4¢ per K.W.H., the next 100 K.W.H. at 3¢ per K.W.H., and the balance at 2¢ per K.W.H. What was the amount of his bill for the month ending March 5?

14. The property in Newcastle is assessed for $9,850,000. The expenses for the year are estimated as follows: street improvements, $37,200; salaries and wages, $92,600; schools, $205,000; sewers and drainage, $14,500; buildings, $27,500; interest on bonded debt, $2,600. (a) Find the tax rate correct to the nearest hundred-thousandth. (b) Express this rate per $1,000. (c) Find the tax on property valued at $8,000 and assessed at 80% of its value.

Section 9 . . . Profit and Loss

To Find the Gross Profit on a Single Article or Quantity of the Article. The profit and loss statement shows the gross profit and net profit of a business for a given period of time, such as a month, a quarter, or a year. Frequently, however, a store owner desires to know the gross profit on a single article or a quantity of the article.

In general, the computation of the gross profit on a single article, or quantity of the article, is similar to the computation of the gross profit on the profit and loss statement. On the profit and loss statement, the sales less the cost of goods sold gives the gross profit. In like manner, the selling price of a single article, or quantity of the article, less the cost gives the gross profit, or margin.

Selling Price − Cost = Gross Profit

In the foregoing formula, the term "cost" refers to the gross cost; that is, the prime cost plus the buying expenses.

In case the article is sold for less than the cost, the selling price is subtracted from the cost, the result representing a loss on the sale.

Cost − Selling Price = Gross Loss

Example: The Grace Clothing Store bought 150 men's summer suits for $3,225 and paid $65 for transportation charges on the purchase. During the regular season the store sold 120 of the suits at $35 each. At the end of the season, the remaining suits were closed out at $25 each. What was the amount of the store's gross profit on the entire lot?

Solution

First, find the selling price of the entire lot.

120 suits @ $35	*$4,200*
30 suits @ $25	*750*
Selling price	*$4,950*

Second, find the gross cost of the purchase.

Prime cost	*$3,225*
Transportation charges	*65*
Gross cost	*$3,290*

Third, find the gross profit.

Selling price	*$4,950*	
Cost	*3,290*	
Gross profit	*$1,660*	*Ans.*

Exercise 30. (Written)

1. The Lane Department Store bought a job lot of 250 wash dresses for $975 and paid $35 for transportation charges on the purchase. The store sold 60 of the dresses at $8.95, 80 at $6.75, and the remainder at $4.50. What was the store's gross profit on the entire lot?

2. The King Hat Store purchased 50 dozen hats at $42 a dozen and paid $20 for express charges on the shipment. The store sold 500 of them at $5.95 and the remainder at $2.95. What was the store's gross profit on the entire lot?

3. A produce dealer purchased 190 bags of potatoes at $6.10 a bag and paid $35 for freight and drayage charges. If he sold the entire lot at $7 a bag, what gross profit did he realize?

4. Paul Frost, hardware dealer, purchased a dozen hammers for $40, less 35%, paid $1.74 for express charges, and then sold them at $2.75 each. What was his gross profit on the dozen hammers?

5. C. F. Martin, retail shoe dealer, purchased 240 pairs of shoes for $1,750, less 20% and 10%, and paid freight charges amounting to $25.20. He marked the shoes to sell at $8 a pair and sold 210 pairs at that price. The remainder were sold during a pre-inventory sale at a discount of 20%. What gross profit did he realize on the entire lot?

To Find the Net Profit on a Single Article or Quantity of the Article. The net profit on a single article, or quantity of the article, may be found in the same manner as the net profit on the profit and loss statement; that is, by deducting from the gross profit on the article the operating expenses connected with the article.

Gross Profit − Operating Expenses = Net Profit

If the operating expenses are greater than the gross profit, the gross profit is subtracted from the operating expenses, the result representing a net loss.

Operating Expenses − Gross Profit = Net Loss

Operating expenses — such as salaries, rent, heat, light, and similar items — apply to all the articles sold during the period. The amount applicable to the sale of a single article, therefore, cannot be determined exactly. It can be estimated, however.

For example, if last year's profit and loss statement shows that operating expenses were 25% of sales, the operating expenses applicable to an article which is sold today for $80 may be estimated at 25% of $80, or $20.

Example: A. B. Swire, retail furniture dealer, pays $45 for a divan and sells it for $75. What is his estimated net profit on the divan if his operating expenses average 32% of the net sales?

Solution:	*Selling price*	*$75*	
	− Cost	*45*	
	Gross profit	*$30*	
	− Operating expenses	*24*	*(32% of $75)*
	Net profit	*$ 6*	*Ans.*

The net profit may also be found by subtracting the sum of the cost and the operating expenses from the selling price.

Selling Price − (Cost + Operating Expenses) = Net Profit

In this manner, the computation of the net profit in the example given above would be:

Selling price		$75
Deduct:		
Cost	$45	
Operating expenses (32% of $75)	24	69
Net profit		$ 6

Exercise 31. (*Written*)

1. An automobile accessories store buys tires at $9.90 and sells them at $16.50. (a) What is the store's gross profit on each tire? (b) If the store figures its operating expenses at 28% of net sales, what net profit is realized on each tire?

2. Stoneman and Company, retail paint dealers, purchased a quantity of paint for $225 and sold it for $465. They estimate their overhead at 42% of net sales. (a) What was their gross profit on the transaction? (b) What was their net profit?

3. The Boyce Electric Company purchased a quantity of table lamps for $375, less 10% and 10%. They sold 15 of the lamps at $20 each, 10 at $17.50, and the remainder, 5, at $15. What amount of net profit did they realize on the entire lot if their cost of doing business is 35% of net sales?

4. A retailer buys bicycles at \$36 each, less 15% and 10%, plus a freight charge of \$1.26 on each bicycle. If he sells them at \$45 and his overhead is 24% of net sales, what is his net profit on each bicycle?

5. A confectionery store bought 250 boxes of candy at 75¢ a box. The store sold 240 boxes at \$1.25 a box. The remainder became unsalable because of spoilage and were thrown away. (a) How much did the store receive from the sale of the entire lot? (b) If the store's operating expenses average 31% of net sales, what net profit was realized on the entire transaction?

To Find the Rate of Gross Profit, Based on the Selling Price of One Article or a Quantity of the Article. A store owner often finds it desirable to compute the rate of gross profit realized on a single article, or quantity of the article, and see how it compares with the average rate of gross profit shown by the percentage analysis of the profit and loss statement. Since the latter rate is based on net sales, the rate of gross profit on a single article is based on the selling price of the article.

$$\textbf{Rate of Gross Profit} = \frac{\textbf{Gross Profit}}{\textbf{Selling Price}}$$

Similarly, the rate of net profit on the selling price is found by dividing the net profit by the selling price.

$$\textbf{Rate of Net Profit} = \frac{\textbf{Net Profit}}{\textbf{Selling Price}}$$

Exercise 32. (*Written*)

1. From a percentage analysis of the statements of profit and loss of the Girvin Shoe Store, the average gross profit is found to be 37%. (a) If the store buys overshoes at \$2.03 a pair and sells them at \$3.50, what rate of gross profit is realized on the selling price of each pair? (b) How many per cent greater or less than the average rate is the rate of gross profit on the overshoes?

2. A men's clothing store finds from past experience that an average gross profit of $37\frac{1}{2}$% of net sales must be realized to cover the operating expenses and provide a satisfactory net profit. (a) If overcoats that can be sold at \$55 each are offered to the store at \$35.75 by the manufacturer, what per cent gross profit would the store realize on the selling price of each coat? (b) Is this per cent greater or less than the desired rate? (c) How many per cent greater or less?

3. A clothier buys men's belts at $14 a dozen and sells them at $1.75 each. What is his per cent gross profit based on the selling price?

4. A clothier purchases suits at $29.25 each and marks them to sell at $50. If he allows the customer a discount of 10%, what is his rate of profit on the selling price?

5. A retailer buys pencils at $2.25 a gross and sells them at 2 for 5¢. What per cent of the selling price does he gain?

6. A fruit dealer bought 10 boxes of grapefruit (80 to a box) at $3.80 a box. He had to throw out 40 grapefruit that had spoiled. He sold the remainder at 4 for 25¢. What was his per cent of profit on the selling price?

Exercise 33. (*Written*)

1. An automobile supplies store purchases tires at $10.05 each and sells them at $15. If the cost of doing business is 25% of net sales, the net profit on each tire is what per cent of the selling price?

2. The Adams Hardware Store buys ironing tables at $3.75 each and marks them to sell at $6.00. If the store's overhead is estimated at 25% of net sales, what rate of net profit does the store realize on each table that it sells at the marked price?

3. A retailer purchases blankets at $67.20 a dozen and sells them at $8.75 each. What rate of net profit does he realize on the selling price if his operating expenses are 24% of net sales?

4. A quantity of goods that cost $1,178 is sold for $1,550. If the overhead expense chargeable to the transaction amounts to $232.50, what is the per cent net profit, based on the selling price?

Problems for Application and Review

Group A

1. (a) What number divided by $4\frac{1}{2}$ gives $8\frac{2}{9}$? (b) Multiply $63\frac{3}{8}$ by $24\frac{2}{3}$. (c) Find the sum of $16\frac{2}{3}$, $31\frac{1}{4}$, and $15\frac{2}{5}$. (d) Multiply $34\frac{3}{8}$ by 26. (e) What amount is $162\frac{1}{2}$% of $2.80? (f) Find the interest at 6% on $245 for 100 days.

2. The Roberts Millinery Shop bought 30 dozen ladies' hats for $1,170, delivered. They sold 160 hats at $6.50 each, 80 at $4.50

each, and the remainder at $2.75 each. (a) What was the gross profit on the entire lot? (b) What was the average gross profit per hat?

3. A retailer wishes to receive $58.50 for a radio after allowing the customer a discount of 10% on the marked price. What should be his marked price for the radio?

4. In the window of a clothing store a suit is marked "$17.50—Formerly $25." At what rate was the price reduced?

5. If $198 represents the amount of an invoice less 1%, what was the amount of the invoice?

6. The cash discount at $2\frac{1}{2}\%$ on an invoice of goods is $11.50. What is the cash price of the goods?

7. Find the single discount that is equivalent to the series 20%, $16\frac{2}{3}\%$, and 10%.

Group B

1. (a) What number divided by $12\frac{3}{8}$ equals $3\frac{1}{3}$? (b) Divide $16\frac{1}{2}$ by $2\frac{3}{4}$. (c) $7.20 is $\frac{15}{16}$ of what amount? (d) $4.86 is what per cent more than $3.60? (e) Express $12\frac{1}{2}$ mills as a decimal part of $1. (f) Find the interest on $325 for 106 days at 6%.

2. What is the rate of profit on the selling price for the grocer who sells a pound package of cheese for 72¢ if it costs him 48¢ a pound?

3. A dealer in electrical appliances purchases a refrigerator for $230, less 20%, 10%, and 5%, and sells it for $265, less 15%. What amount of gross profit does he realize?

4. A furniture dealer wishes to mark a living-room suite so that he may receive $386.75 for it after allowing the customer a discount of 15%. What should be the marked price?

5. In order to take advantage of the discount on a bill of goods amounting to $3,450, bought on December 4, terms 3/5, 2/20, n/60, Mr. Thomas borrowed enough money to pay the bill on December 9, giving his 55-day note at 6%. How much did he save?

6. Baker & Company offers to fill an order for goods at $1,476.35, less 15% and 10%. Pratt & Son ask $1,500 with 25% off. Which is the better offer and how much better?

Section 10 . . . Pricing Goods—Sales Price Basis

To Find the Cost Price of an Article When the Selling Price and the Rate of Gross Profit on Selling Price Are Known. Many stores follow the practice of standardizing their prices and of stocking each kind of article in three or four *price lines*, according to grade or quality. Such a plan makes it possible to meet the requirements of customers of different incomes, without having to carry too large a stock of merchandise.

A men's furnishings store, for example, may specialize in suits that sell at \$40, \$45, \$50, and \$55; shoes at \$6.50, \$7.00, and \$8.50; shirts at \$1.95, \$2.45, and \$2.95; neckties at \$1.00, \$1.50, and \$2.00; and so on.

When the store owner has to purchase merchandise to replenish a certain line, the selling price is already known, and his problem is one in determining the highest price he can afford to pay for the article and still realize the desired rate of gross profit on the selling price.

Example: The owner of the Betty Lou Dress Shop has to buy dresses for the line that sells for \$7.98. He has learned from past experience that his gross profit must be 40% of the selling price in order to cover the operating expenses and leave a satisfactory net profit. What is the highest price he can afford to pay for the \$7.98 line of dresses?

Analysis: The highest price he can pay represents the retailer's cost, which is found by subtracting the gross profit from the selling price.

Selling Price − Gross Profit = Cost

Since the gross profit is 40% of the selling price, the amount of the gross profit is 40% of \$7.98.

Solution:			
	Selling price	*\$7.980*	
	Gross profit	*3.192*	*(40% of \$7.98)*
	Cost	*\$4.788, or \$4.79*	

The highest price he can afford to pay is \$4.79. Ans.

Checking the Calculation of the Cost Price. The calculation of the cost price may be checked by first calculating the cost price in terms of per cent and then applying that per cent to the selling price.

In the example on page 355, the gross profit is 40% *of the selling price.* Hence, the selling price is the *base,* or whole, and represents 100% of itself.

Since *Selling Price* – *Gross Profit* = *Cost,* the cost, expressed in terms of per cent, is 100% – 40%, or 60% *of the selling price.* The dollar cost is therefore 60% of $7.98, or $4.79. Thus,

$$\begin{array}{rl} 100\% \text{ of Selling Price} = & \text{Selling Price} \\ -\ \underline{40\%} \text{ of Selling Price} = & \underline{\text{Gross Profit}} \\ 60\% \text{ of Selling Price} = & \text{Cost} \\ 60\% \text{ of } \$7.98 = & \$4.79, \text{ Cost} \end{array}$$

Exercise 34. (*Written*)

In each of the following problems, the cost price is to be found by the method explained on page 355 and then checked by the method explained above.

1. The owner of a women's apparel store has to buy coats for the line that sells for $40. What is the most he can pay for this line if the gross profit must be 45% of the selling price?

2. What is the most that the store owner should pay per dozen for neckties which retail at $1.50 each, if he must realize 34% gross profit on the selling price?

3. If a retail shoe dealer realized 35% gross profit on rubbers that he sells for $2.60 a pair, what is the cost per pair to the retailer?

4. The buyer for the Stoneham Department Store is in the market for women's handbags that retail for $3.75. What is the highest price he may pay for the bags if the store's operating expenses average 30% of net sales and a net profit of 6% of the selling price is desired?

5. The owner of a haberdashery store has to buy a quantity of gloves for the line that he sells at $4.50 a pair. His operating expenses average 35% of net sales and he desires a net profit of 10% of the selling price. What is the highest price he can pay for this line of gloves per dozen pairs?

To Find the Price at Which an Article Should Be Sold to Yield a Given Rate of Gross Profit, Based on the Selling Price. A store owner sometimes purchases merchandise that is different in style or quality from that represented by his regular price lines and which therefore must be priced differently. In such cases, the cost price of the article is known, and the store owner's problem is one in determining the lowest price at which he can sell the article and still realize a gross profit sufficient to cover expenses and leave a satisfactory net profit.

Example: The owner of a men's clothing store purchases a quantity of top coats at $21 each. He knows from past experience that his gross profit must be 40% of the selling price in order to cover expenses and leave a satisfactory net profit. What is the lowest price at which he can sell the coats and still realize the desired rate of gross profit?

Analysis: The per cent given in the problem is based on the selling price, which is unknown. The problem indicates, however, that if 40% of the selling price is subtracted from the selling price, the remainder is $21.

Selling Price − 40% of Selling Price = $21

Since the per cent is based on the selling price, the selling price is the base, or whole, and is therefore 100% of itself.

Solution:

$$\begin{array}{rcl}
100\% \times \textit{Selling Price} &=& \textit{Selling Price}\\
-\ \underline{40\%} \times \textit{Selling Price} &=& \underline{\textit{Gross Profit}}\\
60\% \times \textit{Selling Price} &=& \textit{Cost} = \$21\\
\textit{Selling Price} &=& \$21 \div 60\%\\
&=& \$21 \div .6 = \$35
\end{array}$$

The lowest price at which he can sell the coat is $35. Ans.

Proof: Selling Price − Gross Profit = Cost
$35 − 40% of $35 = $35 − $14 = $21

Exercise 35. (*Written*)

1. A. R. Winton, owner of a house furnishings store, buys rugs at $33 each. He knows from past experience that his gross profit must be 34% of his selling price in order to cover expenses and leave a satisfactory net profit. What is the lowest price at which he can sell each rug and still realize 34% profit on the selling price?

2. For how much must a retailer sell an article that costs him $.88 if he desires to make a gross profit of 45% on the selling price?

3. A department store purchased towels at $5.76 per dozen. At what price must each towel be sold to gain 30% on the selling price?

4. A department store bought 1,000 pairs of shoes of the same style and quality for $3,320. At what price per pair should the store sell the shoes to gain $33\frac{1}{3}\%$ of the selling price?

5. A grocer buys a case of canned salmon (24 cans to the case) for $10.26. At what price should he sell each can in order to realize a gross profit of 25% on the selling price of the entire lot?

6. A clothier bought boys' sweaters at $45 per dozen, less 20% and 10%. At what price must he sell each sweater to gain 40% on the selling price?

To Find the Price at Which an Article Should Be Sold to Cover the Operating Expenses, Expressed as a Per Cent, and Yield a Given Rate of Net Profit. In some situations the store owner's problem is one in finding the lowest price at which he can sell an article so as to cover the operating expenses, expressed as a per cent, and yield a desired rate of net profit. In such cases, the selling price is calculated in two steps, as follows:

(1) Add the operating expenses and desired net profit, expressed as per cents of the selling price. The sum represents the rate of gross profit.

(2) Then compute the selling price by the method explained on page 357.

Exercise 36. (*Written*)

1. An electric refrigerator is billed to a retailer at $156. If the retailer's operating expenses amount to 25% of the sales, at what price must he sell the refrigerator in order to realize a net profit of 10% on the selling price?

2. A retail dealer purchases bicycles at $27.50 each. If he computes his cost of doing business at 25% of sales, for how much must he sell each bicycle in order to make a profit of $12\frac{1}{2}$% of the selling price?

3. A certain grocer estimates his overhead expenses at 17% of net sales. If he desires a net profit of 8% of the selling price, at what price must he sell a bag of flour that costs him $1.62?

4. A washing machine is billed to a dealer at $105. He allows his salesman a commission of 8% on sales and figures his overhead expenses at 20% of sales. At what price should he sell the washing machine to gain a net profit of 12% on the selling price?

5. A certain dealer estimates his selling expenses to be 15%, other overhead expenses 12%, and net profit 5%, all based on the selling price. At what price must he sell merchandise that costs him $187 in order to cover expenses and make the desired net profit?

To Find the Price at Which an Article Should Be Marked to Yield a Given Rate of Profit, Based on the Selling Price, After Allowing a Discount from the Marked Price. A merchant sometimes desires to mark an article so that he can offer the customer a discount on the marked price and still realize the required rate of profit on the selling price. The marked price is calculated in two steps, as follows:

(1) Find the selling price by the method explained on page 357.
(2) Using the selling price obtained in (1), above, find the marked price by the method explained on page 345.

Exercise 37. (*Written*)

1. A furniture dealer buys a bookcase for $54. He desires to make a gross profit of 20% on the selling price after allowing his customer a discount of 10% on the marked price. What should be his marked price for the bookcase?

2. A clothier purchases a quantity of suits at $32.40 each. Find the price at which he must mark each suit in order to make a profit of 25% on the selling price after allowing an advertised discount of 10% on the marked price.

3. A dealer bought a camera for $28 less 25%. He marked it to gain 33⅓% on the selling price after allowing the purchaser a discount of 12½%. What was the marked price?

4. A retailer buys men's shirts at $30 a dozen, less 20% and 12½%. What should be the marked price of each shirt if he desires to allow the purchaser a discount of 16⅔% and realize a gross profit of 30% on the selling price?

5. A dealer pays $56, less 25% and 10%, for a rug. Overhead expenses amount to 22% of the selling price. He sells the rug to net 8% on the selling price, after allowing a discount of 20% on the marked price. What is the marked price?

Problems for Application and Review

Group A

1. (a) .98½ times what amount equals $738.75. (b) 21⅞ is what part greater than 12½? (c) $4.20 is $\frac{5}{12}$ smaller than what amount? (d) Find the interest at 6% on $550 for 50 days.

2. An electric iron cost a dealer $7.20. At what price should he sell the iron to yield a profit of 40% on the selling price?

3. A clothier bought caps at $18 a dozen and sold them at $2.25 each. What was the per cent of gross profit based on the selling price?

4. The cash price of an invoice, after deducting $2\frac{1}{2}\%$ discount, is $828.75. What is the invoice price?

5. If a merchant saved $8.34 by taking a cash discount of 3%, what was the amount of the invoice?

6. An invoice of goods amounting to $126 was dated May 27. If the terms were 2/10, n/30, what amount would be required to pay for the goods on June 6?

Group B

1. (a) What number divided by $4\frac{1}{3}$ gives $3\frac{1}{2}$? (b) $7\frac{1}{8}$ is what part smaller than $9\frac{1}{2}$? (c) Find the sum of $7\frac{3}{8}$, $9\frac{3}{4}$, and $4\frac{5}{6}$. (d) Find the interest on $485 for 56 days at 6%.

2. An electric refrigerator is billed to a dealer at $220, less 25%. The dealer's overhead expenses amount to 25% of the sales. At what price must he sell the refrigerator to gain 15% on the selling price?

3. For how much must goods that cost $147 be sold to gain $16\frac{2}{3}\%$ of the selling price?

4. A clothier purchased topcoats for $24.50 and sold them for $36. In order to increase his sales, the clothier advertised the coats as follows: "Sale of Topcoats—Formerly $36—Now $31.50." (a) What was the percent of discount offered on the topcoats during the sale? (b) If the clothier sold 12 topcoats a day before the sale, but sold 26 topcoats the day of the sale, what was the amount of the increase or decrease in the daily profit during the sale?

5. What single discount is equivalent to the series 20%, 25%, and 10%?

6. A catalog lists an article at $24. The selling price is $21. What rate of trade discount is offered?

Group C

1. (a) Subtract $32\frac{3}{4}$ from $61\frac{1}{8}$. (b) Multiply $38\frac{5}{8}$ by $24\frac{1}{2}$. (c) Find $3\frac{2}{3}\%$ of $225. (d) Find the interest at 6% on $348 for 57 days.

2. A dealer buys fountain pens at $36 a dozen, less 25% and 20%. The overhead of the store amounts to 25% of its sales. At what price must the dealer sell each pen in order to gain 15% on the selling price?

3. Gasoline that was purchased for 22¢ a gallon was sold at 27.5¢ a gallon. At this price 500 gallons a day were sold. During a gasoline war the sales price of the same gasoline was reduced to 6 gallons for $1.55. At this price 660 gallons were sold in a day. Was the profit decreased or increased, and how much?

4. G. M. Brooks, a dealer in radios, purchased 20 radios at list price, less 33⅓% and 10%, and sold them at the same list price less 10%. What was the gross profit on each radio if the list price was $40?

5. At what price should a retailer mark an article so that he may receive $4.62 for it after allowing the customer a discount of 12%?

6. A dealer marked a rug $68. During a special sale, it was sold for $54.40. What was the rate of discount on the marked price?

Group D

1. (a) Subtract 56⅘ from 221¾. (b) Divide 7⅛ by 9½. (c) $39.15 is 145% of what amount? (d) Find the interest on $410 for 52 days at 6%.

2. A shoe store proprietor buys shoes at $7 a pair. He desires to make a profit of 20% on the selling price after offering a discount of 12½% on the marked price. At what price must each pair be marked?

3. A dealer bought chocolate bars for 80¢ a box (24 bars) and sold them for 5¢ a bar. What per cent of the selling price was gained?

4. The discount at 4% on an invoice of goods is $16. What is the net cost?

5. An invoice of merchandise amounting to $4,200 was purchased on April 9, terms 2/10, n/30. How much would be gained by borrowing money at 6% interest on April 19 in order to take advantage of the discount offer?

6. The Rowe Manufacturing Company offered to sell a dining-room suite to a dealer for $250, less 20%, 10%, and 10%. The Wilson Furniture Company offered to sell a dining-room suite of similar quality for $260, less 40%. (a) Which is the better offer? (b) How much is saved by taking advantage of it? (c) What single discount is equivalent to the series 25%, 20%, and 10%?

To Find the Rate of Gross Profit, Based on the Cost of One Article or a Quantity of the Article. In the preceding sections, the rate of gross profit on an article was based on the selling price of the article. A merchant may, if he desires, base his rate of gross profit on the cost of the article rather than the selling price. When this is done, the rate is found by dividing the gross profit by the cost.

$$\text{Rate of Gross Profit} = \frac{\text{Gross Profit}}{\text{Cost}}$$

In the foregoing formula, the term "cost" refers to the gross cost; that is, the prime cost of the article plus the buying expenses.

Exercise 38. (*Written*)

1. A piano dealer bought a piano for $1050 and sold it for $1,750. (a) His gross profit was what per cent of the cost? (b) What per cent of the selling price?

2. A furniture dealer bought a couch for $125, less 40%, and sold it for $120. What was his rate of profit based on (a) the cost and (b) the selling price?

3. The catalog price of a radio set is $45. (a) If a dealer purchases a set at the catalog price, less 33⅓% and 10%, and sells it at the catalog price, his gain is what per cent of the selling price? (b) What per cent of the cost?

4. A traveling bag listed at $40 is purchased by a retailer at the list price less 37½% and 10%. If he sells the bag at the same list price less 10%, what per cent of the cost does he gain?

5. A retailer purchased an article for $28 and offered it for sale at $52. He finally accepted 12½% less than the asking price. Find his gain per cent on the cost.

6. The Mayfair Stationery Store buys fountain pens at $45 a dozen, less 33⅓% and 25%, and sells them at $3 each. On the purchase and sale of each dozen pens, what is the store's rate of gross profit based on (a) the cost and (b) the selling price?

To Find the Price at Which an Article Should Be Sold to Yield a Given Rate of Gross Profit, Based on the Cost. When the rate of profit is based on the cost, the calculation of the selling price is performed in two steps:

(1) Compute the amount of the gross profit. Since the rate of gross profit is based on the cost, the amount of the gross profit is found by multiplying the cost by the rate.

Rate of Gross Profit × Cost = Gross Profit

(2) Compute the selling price by adding the amount of the gross profit to the cost.

Cost + Gross Profit = Selling Price

Example: A furniture dealer purchases a club chair for $25. He knows from past experience that his gross profit must be 60% of the cost in order to cover expenses and leave a satisfactory net profit. What is the lowest price at which he can sell the chair and still realize the desired rate of gross profit?

Solution:

(1) 60% of $25 = .6 × $25 = $15, gross profit

(2)	*Cost*	*$25*
	Gross Profit	*15*
	Selling price	*$40*

The lowest price at which he can sell the chair is $40. Ans.

When the rate of gross profit is based on the cost, the gross profit, which is added to the cost, is often referred to as the *markup*, and the article is said to be *marked up* a stated per cent. Thus, in the foregoing example, it would be said that the chair is *marked up* 60% on the cost and that the amount of the *markup* is $15.

Checking the Calculation of the Selling Price. The calculation of the selling price may be checked by first calculating the selling price in terms of per cent and then applying that per cent to the cost price.

In the example on this page, the gross profit is 60% *of the cost.* Hence, the cost is the *base* and represents 100% of itself.

Since *Cost + Gross Profit = Selling Price,* the selling price, expressed in terms of per cent, is 100% + 60%, or 160% *of the cost.* The dollar selling price is therefore 160% of $25, or $40. Thus,

$$\begin{array}{rcl} 100\% \text{ of Cost} & = & \text{Cost} \\ \underline{+\ 60\% \text{ of Cost}} & = & \underline{\text{Gross Profit}} \\ 160\% \text{ of Cost} & = & \text{Selling Price} \\ 160\% \text{ of } \$25 & = & \$40, \text{ selling price} \end{array}$$

Exercise 39. (*Written*)

In each of the following problems, the selling price is to be found by the method shown in the first solution on page 363 and then checked by the method shown in the solution at the bottom of page 363.

1. A dealer paid \$42.50 for a kitchen stove and \$2.50 for the freight charge. What is the lowest price at which he may sell the stove if he desires to make 55% gross profit, based on the cost?

2. An equipment dealer marks his goods 36% above cost. At what price should he mark an electric pump that cost him \$32.90, plus a freight charge of \$4.60?

3. A hardware dealer buys lawnmowers at \$25, less 30% and 10%, plus a shipping charge of \$1.25 on each lawnmower. At what price should he mark them to gain 37½% on the cost?

4. An electric washer is billed to a dealer at \$150, less 25% and 10%, plus a delivery charge of \$3.75. What should be his selling price of the washer if he desires a gross profit of 25% on the cost?

5. A grocer purchased one crate of oranges (216 to the crate) at \$5.65 and paid 65¢ for transportation on the shipment. At what price per dozen should he sell the oranges in order to make a profit of 40% on the cost?

To Find What Rate of Gross Profit, Based on Cost, Is Equivalent to a Given Rate of Gross Profit Based on Selling Price. A merchant can readily find the equivalent rate of profit, based on cost, in the following manner:

(1) Express the gross profit and the cost as per cents of the selling price.

(2) Divide the gross profit per cent by the cost per cent.

Example: What rate of gross profit, based on the cost, is equivalent to a gross profit of 20% on the selling price?

Solution:

$$\begin{array}{lrl} (1) & 100\% \text{ of Selling Price} & = \text{Selling Price} \\ & -\ \underline{20\%} \text{ of Selling Price} & = \underline{\text{Gross Profit}} \\ & \overline{80\%} \text{ of Selling Price} & = \text{Cost} \end{array}$$

$$(2)\ \text{Rate of Gross Profit on Cost} = \frac{\text{Gross Profit}}{\text{Cost}}$$

$$= \frac{20\%}{80\%} = \frac{1}{4} = 25\%\ \textit{Ans.}$$

Exercise 40. (Written)

1. What rate of gross profit on the cost is equivalent to a gross profit of $33\frac{1}{3}\%$ on the selling price?

2. If a merchant desires to mark an article so as to gain $37\frac{1}{2}\%$ of the selling price, the article should be marked up what per cent of the cost?

3. What per cent of the cost should an article be marked up so as to yield 25% gross profit on the selling price?

4. If a retailer marks a set of dishes so as to gain 40% on the selling price, what per cent of the cost does he gain?

5. In each of the following, find what rate of gross profit, based on the cost, is equivalent to the stated rate of gross profit on the selling price. Express the result to the nearest tenth per cent.

	Gross Profit on S.P.	Gross Profit on Cost		Gross Profit on S.P.	Gross Profit on Cost
a.	30%	?	e.	26%	?
b.	35%	?	f.	39%	?
c.	45%	?	g.	46%	?
d.	55%	?	h.	36%	?

To Find What Rate of Gross Profit, Based on Selling Price, Is Equivalent to a Given Rate of Gross Profit on Cost. If the rate of gross profit on cost is known, the equivalent rate on the selling price can be found in the following manner:

(1) Express the gross profit and the selling price as per cents of the cost price.

(2) Divide the gross profit per cent by the selling price per cent.

Example: What rate of gross profit, based on the selling price, is equivalent to a gross profit of 25% on the cost?

Solution:

$$\begin{array}{rl} (1) & 100\% \text{ of Cost} = \text{Cost} \\ + & \underline{25\%} \text{ of Cost} = \underline{\text{Gross Profit}} \\ & 125\% \text{ of Cost} = \text{Selling Price} \end{array}$$

$$(2)\ \text{Rate of Gross Profit on Selling Price} = \frac{\text{Gross Profit}}{\text{Selling Price}}$$

$$= \frac{25\%}{125\%} = \frac{1}{5} = 20\% \quad \textit{Ans.}$$

Exercise 41. (*Written*)

1. What rate of gross profit, based on the selling price, is equivalent to a gross profit of 50% on the cost?

2. A clothier's markup on an overcoat is 60% of the cost. What per cent of the selling price does he gain?

3. What is the rate of gain on the selling price when an article is marked up 100% on the cost?

4. A grocer marks up a certain line of canned goods $33\frac{1}{3}\%$ on the cost. What is the rate of profit on the selling price?

5. What per cent of the selling price is gained when an article is sold at $66\frac{2}{3}\%$ above cost?

To Find the Price at Which an Article Should Be Marked to Yield a Given Rate of Profit, Based on the Cost, After Allowing a Discount from the Marked Price. A merchant may desire to mark an article so that he can offer the customer a discount and realize a given rate of profit on the cost. The marked price is calculated in two steps, as follows:

(1) Find the selling price by the method explained on page 362.
(2) Using the selling price obtained in (1), above, find the marked price by the method explained on page 345.

Exercise 42. (*Written*)

1. A furniture dealer buys a bookcase for $27. At what price must he mark it in order that he may allow the customer a discount of 10% on the marked price and still make a profit of 55% on the cost?

2. A clothier purchases a quantity of suits at $25.50 each. Find the price at which he must mark each suit in order to make a profit of $33\frac{1}{3}\%$ on the cost after allowing an advertised discount of 15% on the marked price.

3. At what price must I mark goods costing $22.80 so that I may allow a discount of 5% on the marked price and still realize a profit of 65% on the cost?

4. A dealer bought a camera for $30, less 25%, and marked it to gain 40% on the cost after allowing the purchaser a discount of $12\frac{1}{2}\%$. At what price did he mark the camera?

5. Gloves costing $28.80 a dozen pairs are marked so as to allow a discount of 20% on the marked price and still yield 50% profit on the cost. What is the marked price of each pair?

To Find the Cost Price of an Article When the Selling Price and the Rate of Gross Profit on Cost Are Known. When a store owner wishes to purchase merchandise to replenish a particular price line, on which he desires to make a given rate of gross profit on the cost, the selling price is already known, and his problem is one in determining the highest price he can afford to pay for the article and still realize the desired rate of gross profit.

Example: The owner of the Joyce Dress Shop has to buy dresses for the line that sells for $8.98. He knows from past experience that his gross profit must be 65% of the cost price in order to cover the operating expenses and leave a satisfactory net profit. What is the highest price he can afford to pay for the $8.98 line of dresses?

Analysis: The per cent given in the problem is based on the retailer's cost, which is unknown. The problem indicates, however, that if 65% of the cost is added to the cost, the sum is $8.98, the selling price.

$$\text{Cost} + 65\% \text{ of Cost} = \$8.98, \text{ Selling Price}$$

Since the per cent is based on the cost, the cost is the *base*, or whole, and is therefore 100% of itself.

Solution:

$$\begin{array}{rcl} 100\% \times \textit{Cost} &=& \textit{Cost} \\ \underline{+\ 65\%} \times \textit{Cost} &=& \underline{\textit{Gross Profit}} \\ 165\% \times \textit{Cost} &=& \textit{Selling Price} = \$8.98 \\ \textit{Cost} &=& \$8.98 \div 165\% \\ &=& \$8.98 \div 1.65 = \$5.44 \end{array}$$

The highest price he can afford to pay is $5.44. Ans.

Proof: $5.44 + 65% of $5.44 = $5.44 + $3.54 = $8.98

Exercise 43. (*Written*)

1. The owner of a women's apparel store has to buy coats for the line that sells for $39.95. What is the highest price he can pay for this line if his gross profit must be 65% of the cost?

2. A shoe store sells a certain line of rubbers at $2.79 a pair. At what price does the store buy them if its profit on this line is 55% of the cost?

3. The buyer for the Wayne Department Store is in the market for a line of women's handbags to retail at $5.85. What is the highest price he may pay for them if the store's gross profit must be 56% on the cost?

4. What does an article cost the retailer if he sells it for $67.50 and gains 80% on the cost?

5. What is the most that the store owner should pay per dozen for neckties that he retails at $.95 each if he must realize 52% gross profit on the cost?

Problems for Application and Review

Group A

1. (a) What number divided by $1\frac{3}{4}$ gives $16\frac{2}{3}$? (b) Find the sum of $12\frac{1}{6}$, $10\frac{2}{3}$, and $15\frac{5}{8}$. (c) What amount is $112\frac{1}{2}$% greater than $3.28? (d) Find the number of days from June 27 to November 9. (e) Find the interest on $385 for 53 days at 6%.

2. Mr. G. W. Diemer pays $6, less 25% and 20%, a yard for lace. At what price per yard should he sell it if he desires a gross profit of 25% on the cost?

3. A clothier buys sweaters at $50 a dozen and sells them at $7 each. Find the clothier's rate of gain on the cost.

4. A merchant bought 20 suits for $720, less 25%. Find the price he must mark each suit to make a profit of 20% on the selling price after allowing an advertised discount of 10% on the marked price.

5. A dealer estimates that his selling and overhead expenses amount to 16% of his total sales. If he buys a rug for $22, less 10% and 10%, at what price must he sell it in order to gain 18% of the selling price?

Group B

1. (a) From $84\frac{1}{4}$ subtract $15\frac{1}{6}$. (b) Multiply $26\frac{3}{4}$ by $18\frac{1}{3}$. (c) Express .16 as a common fraction. (d) Find the due date of an 80-day note dated September 21. (e) Find the interest at 6% on $280 for 55 days.

2. A profit of 25% on the cost of an article is equivalent to what per cent of the selling price of the article?

3. A gain of 22% on the selling price is equivalent to what per cent gain on the cost, computed to the nearest tenth per cent?

4. A dealer marks goods 25% above the gross cost. Find the marked price of a desk costing $32.40, on which he had to pay freight charges amounting to $4.80.

5. A fruit dealer purchased a crate of melons, 3 dozen melons to the crate, for $5.40. If he sold the melons at 20¢ apiece, what per cent did he gain on the cost?

Group C

1. (a) What number multiplied by 3⅓ gives $150? (b) Express .024 as a common fraction. (c) Express 9.5 mills as a decimal part of $1. (d) What is the due date of a 90-day note dated May 29? (e) Find the interest on $425 for 58 days at 6%.

2. A merchant sold an electric refrigerator for $275 at a profit of ⅕ of the cost. Find the cost.

3. What must I mark goods costing $21.92 so that I may allow a discount of 5% and still gain 30% on the cost?

4. In the shoe department of Rolfe's Clothing Store, men's shoes are marked up 48% on the cost. What is the rate of gross profit on the selling price, computed to the nearest tenth per cent?

5. A jeweler wishes to mark a watch so as to gain 42% on the selling price. What per cent above cost, to the nearest tenth per cent, should he mark the watch?

6. What single rate of discount is equivalent to the series 20%, 12½%, and 5%?

Group D

1. (a) Add: 10.73; 902.1; 5.784; .296. (b) Divide 75.6 by 180. (c) Add: 2⅗; 5⅓; 4½. (d) Divide 6⅑ by 3⅔. (e) Subtract 12¼ from 22⅕. (f) Find 118% of 96. (g) Find the interest on $435 for 130 days at 6%.

2. Avery, a furniture dealer, bought 60 rugs at $55 each. He sold 25 of them at $82 each, and 30 at $65 each. At what price must he sell the remaining rugs in order to gain 30% on the cost of all the rugs?

3. Kelsey, an office equipment dealer, bought a desk for $98 less 20%. He also paid freight charges of $6.60. If his overhead expenses average 17% of sales, at what price should he sell the desk in order to make a net profit of 15% of the selling price?

4. A desk sold for $63 after a 10% discount had been deducted from its original price. What was its original price?

5. Sherman insured his property for three years for $6,600. The rate for the entire three-year period was 48 cents per $100. What was the average annual cost of this policy?

Weekly Payrolls. In many businesses, workers are paid by the hour. Large establishments usually require each worker to keep a record of his time by means of a time clock and time cards, as described on page 78. From the record on the time cards, a clerk prepares the weekly payroll.

PAYROLL WEEK ENDED March 10, 19--

NAME	TIME RECORD						HOUR RATE	TOTAL HOURS		TOTAL WAGES	DEDUCTIONS			NET WAGES
	M	T	W	T	F	S		REGULAR	OVERTIME		F.I.C.A.	INC. TAX	TOTAL	
R. Adams	8	8	8	8	8	4	$1.70	40	4	$78.20	$1.17	$13.20	$14.37	$63.83
G. Bell	6	8	8	9	8	0	2.10	38	1	82.95	1.24	14.00	15.24	67.71
H. Couse	8	7	9	9	8	4	1.80	39	6	86.40	1.21	14.80	16.01	70.39
									TOTALS	$247.55	$3.62	$42.00	$45.62	$201.93

Payroll

The payroll shows the hours worked by each employee, his hourly rate, the total wages earned, the deductions for social security (F.I.C.A.) and income taxes, the net wages of each employee, and the totals for all the employees.

Change Sheet and Change Memorandum. Unless payment of wages is made by check, the payroll clerk must secure from the bank sufficient money in the proper denominations to pay the net wages of each employee. He therefore prepares a change sheet in order to find the number of bills and coins needed to pay

CHANGE SHEET March 10, 19--

NAME	NET WAGES		$20	$10	$5	$1	50¢	25¢	10¢	5¢	1¢
R. Adams	$63	83	3			3	1	1		1	3
G. Bell	67	71	3		1	2	1		2		1
H. Couse	70	39	3	1				1	1		4
TOTALS	$201	93	9	1	1	5	2	2	3	1	8

Change Sheet

each employee in the largest denominations possible.

The totals of the denominations needed, as indicated on the last line of the change sheet, are then listed on a change memorandum. The change memorandum, together with the company's check for the total amount, is presented by the payroll clerk to the bank teller, who delivers the cash in the desired denominations.

CHANGE MEMORANDUM			
DENOMINATION	NO.	AMOUNT	
$20 00	9	180	00
10 00	1	10	00
5.00	1	5	00
1 00	5	5	00
.50	2	1	00
.25	2		50
.10	3		30
.05	1		05
.01	8		08
TOTAL		201	93

Change Memorandum

Exercise 44. (*Written*)

1. Copy and complete the following payrolls. Assume that overtime is allowed for time worked in excess of 8 hours on any day and that time and a half is paid for overtime. The Federal Old-Age Benefits tax is 1½% of the employee's total wages.

(a) P. E. Ross and Sons, for the week ended June 7, 19__.

Name	Time Record						Hour Rate	Total Hours		Total Wages
	M	T	W	T	F	S		Regular	Overtime	
J. J. Dunn	8	9	9	8	8		$2.10	?	?	?
H. S. Mann	7	0	9	8	8		1.88	?	?	?
F. C. Taft	8	9	9	8	9		1.65	?	?	?
									Total	?

(b) Mason and Grant, for the week ending May 14, 19__.

Name	Hour Rate	Total Hours		Total Wages	Deductions			Net Wages
		Regular	Overtime		F.I.C.A.	Inc. Tax	Total	
H. S. Coyle	$2.24	38	1½	?	?	$15.60	?	?
R. E. Link	1.96	40	1	?	?	13.60	?	?
E. F. Usher	1.88	40	2½	?	?	14.00	?	?
			Totals	?	?	?	?	?

2. For each of the following, prepare a change sheet and a change memorandum like those shown on pages 370 and 371.

(a) Burke and Sons, for week ended May 15, 19--: E. Gill, \$78.89; W. Lamb, \$91.43; C. Reed, \$68.68; R. Ward, \$85.61.

(b) Kass Brothers, for week ended May 22, 19--: L. Cole, \$74.97; D. Hill, \$67.80; T. Ives, \$76.38; F. Jade, \$82.30.

Problems for Application and Review

Group A

1. (a) Divide 62.156 by 3.79. (b) Subtract 84.359 from 192. (c) Add: $6\frac{1}{4}$; $4\frac{1}{3}$; $9\frac{1}{5}$. (d) Using the four-step process, multiply $48\frac{1}{6}$ by $18\frac{1}{4}$. (e) Multiply .867 by .5481.

2. A merchant buys rugs for \$110, less 10%. Freight charges are \$6. At what price must he sell these rugs in order to make a gross profit of $33\frac{1}{3}\%$ of their total cost?

3. Rulers purchased at 80 cents a dozen were sold for 8 cents each. What was the per cent of gain based on the selling price?

4. A ticket sold for \$.96. This price included a 20% federal tax on admissions. What was the price of admission, before the tax was added?

5. A delivery truck that costs \$2,400 is estimated to have a trade-in value of \$600 five years later. What will be the estimated value of the truck at the end of its third year?

Group B

1. (a) Using the four-step process, multiply $27\frac{1}{4}$ by $8\frac{1}{3}$. (b) Subtract $4\frac{3}{8}$ from $23\frac{1}{3}$. (c) Divide 47.432 by 15.4. (d) Add: $8\frac{1}{3}$; $6\frac{2}{5}$; $3\frac{1}{3}$. (e) Multiply 66.7 by .009.

2. A chair costs \$24. The merchant's expenses average 25% of his sales. At what price should the chair be sold to yield a net profit of 15% on the selling price?

3. At a special sale, a table sold for \$60 after a discount of 20% had been deducted. What was the former selling price?

4. Barker insured his office building valued at \$15,000 for 80% of value paying 54¢ per \$100 for a 3-year policy. What was the average yearly cost of the insurance?

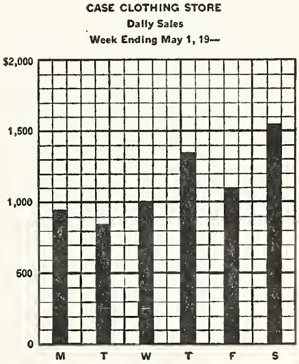
5. Williams, a salesman, receives a commission of 8% on all sales. In December he earned \$250 in commissions. What was the total of his sales for that month?

Purpose and Kinds of Charts. Merchants, manufacturers, and others engaged in various types of business activities make extensive use of charts to picture the figures representing the results of their business operations. Such charts are useful because they show relationships and trends that are not readily discernible when the figures are presented in ordinary tabular form.

There are numerous types of charts. Five that are commonly used are:

1. Vertical bar charts
2. Horizontal bar charts
3. Curved-line charts
4. Rectangle charts
5. Circle charts

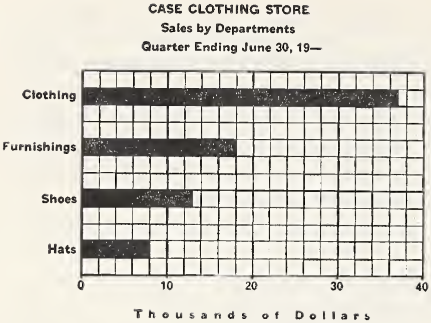
Vertical Bar Charts. A typical vertical bar chart is shown in the illustration at the right. It shows in graphic form the daily sales of the Case Clothing Store for one week. There is one bar for each day of the week, Monday through Saturday, as indicated at the bottom of the chart. The length of each bar is proportional to the sales for that particular day. The scale by which the bars are laid off, or measured, is shown at the left of the chart.



Vertical Bar Chart

In the illustration, each vertical division of the chart paper represents $100, as indicated by the scale at the left. The length of each bar has been made accurate to the nearest $50. For example, the actual sales for Monday were $947.60. Before this was plotted on the chart, it was rounded to the nearest $50, giving $950. The top of the bar for Monday was therefore placed midway between the vertical division representing $900 and the division representing $1,000.

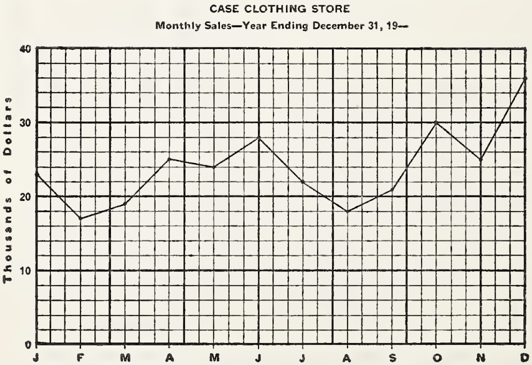
Horizontal Bar Charts. A typical horizontal bar chart is shown in the illustration at the top of page 374, which shows the sales by departments of the Case Clothing Store for the quarterly period ending June 30. This chart is similar to a vertical bar chart except that the bars are extended horizontally.



Horizontal Bar Chart

In the illustration, each horizontal division of the chart paper represents $2,000, as indicated by the scale at the bottom of the chart. The length of each bar has been made accurate to the nearest $1,000. The actual sales of the clothing department, for example, were $37,462.50. Before this was plotted on the chart, it was rounded to the nearest $1,000, giving $37,000. The right end of the "Clothing" bar was therefore placed midway between the horizontal division representing $36,000 and the division representing $38,000.

Curved-Line Charts. When it is desired to picture figures extending over a period of time, the curved-line chart is often particularly appropriate, although the vertical bar chart may also be used to show such data. A curved-line chart showing the monthly sales of the Case Clothing Store is illustrated below.



Curved-Line Chart

The curved line extending across the chart shows the fluctuation in sales from month to month, for one year, from January through December. The time scale extends from left to right and is usually indicated at the bottom of the chart. The value or quantity scale extends from bottom to top and is indicated at the left.

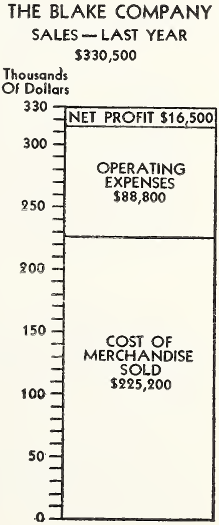
In plotting the chart shown in the illustration, the monthly sales figures were first rounded to the nearest $1,000. The curve was then charted by placing on the chart dots showing each month's sales and connecting successive dots by a line, drawn with a ruler.

When it is desired to compare two or more sets of facts over a period of time, two or more curves may be drawn on the same chart. Thus, if it is desired to show the monthly fluctuations of the sales, operating expenses, and net profit, a solid line may be used for charting the sales, a dotted line for the operating expenses, and a dash-and-dot line for the net profit; or lines of different colors may be used if colored inks or pencils are available.

Rectangle Charts. A rectangle chart may be used when it is desired to show the relationships of parts to the whole and to each other. The entire rectangle, which may be constructed either vertically or horizontally, represents the whole. Sections of the chart represent parts of the whole.

The rectangle chart at the right shows the total sales of The Blake Company for last year. Sections of the rectangle show the amount of sales represented by cost of goods sold, operating expenses, and net profit.

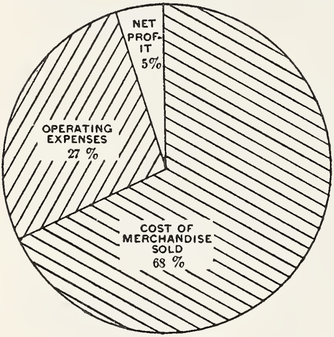
The scale of the rectangle in the illustration indicates that each division represents $10,000. Each section has been charted to the nearest $5,000. The cost of goods sold, $225,200, takes up the first 22½ spaces; the operating expenses, $88,800, takes up the next 9 spaces; and the net profit, $16,500, takes up the last 1½ spaces.



Rectangle Chart

A rectangle chart may also be used when the parts are expressed in terms of per cents of the whole instead of in terms of dollar amounts. In such cases, the entire rectangle represents 100%; and the scale at the left is marked off in convenient divisions of 100%, such as divisions representing 1% or 2%.

Circle Charts. Like the rectangle chart, the circle chart is especially valuable in showing the relationship between the parts and the whole. It is frequently used to present information on the basis of per cent, the complete circle, 360°, representing 100%. Thus, the circle chart at the left shows in per cent form the same information that was presented in dollar values in the rectangle chart on page 375.



Circle Chart

In constructing the circle in the illustration, it was first necessary to change the dollar amounts to per cents and then to convert each per cent into degrees. For example, the manufacturing cost was calculated to be 56% of the total sales ($1,860,000 ÷ $3,305,000). The equivalent in degrees was found to be 202° (56% of 360°). In like manner the degree equivalents of the remaining sections of the circle were found. A circle was then drawn with a compass and the angles laid off with the aid of a protractor.

Exercise 45. (*Written*)

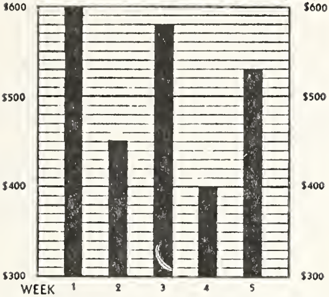
1. The graph at the top of page 377 shows the weekly sales made by William Graves for the first five weeks of the current year. Using the information shown on the graph, answer the following questions.

a. What were Graves' sales during the third week?

b. In which week did he make the smallest total sales?

c. In which two weekly periods were his sales nearest the same amount?

d. By what amount did his sales for the second week differ from his sales for the fourth week?


WILLIAM GRAVES'
WEEKLY SALES RECORD FIRST FIVE WEEKS OF 19--

e. What were his average sales for the five-week period?

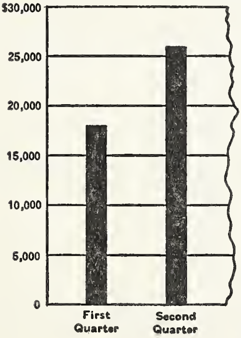
f. If he received 15% commission on all sales, what total commission did he earn for the entire five-week period?

2. The quarterly sales of the Goodhue Manufacturing Company last year are shown in the table at the right. Prepare a vertical bar chart showing this information.

Use regular chart paper if possible, and space the bars about half an inch apart. Let each vertical division represent $1,000 of sales, and label each $5,000 in the vertical scale at the left. Continue the vertical scale until you reach $40,000, which is the lowest multiple of $5,000 that will provide space for the largest volume of quarterly sales. Plot each bar to the nearest $1,000.

QUARTER	SALES
First	$27,694.15
Second	18,348.76
Third	35,162.41
Fourth	24,818.02

If chart paper is not available, use a sheet of notebook or blank paper. Draw a horizontal base line, or zero line, with your ruler. Draw a horizontal line across the chart at each $5,000 division, using $\frac{1}{16}$ of an inch for each $1,000. Then measure off each bar vertically from the base line. A portion of a similar chart constructed in this manner is shown in the illustration at the left.



3. The sales of the Johnson Company for four years were as follows:

First year	$40,161.50	Third year	$32,516.46
Second year	44,992.54	Fourth year	48,219.73

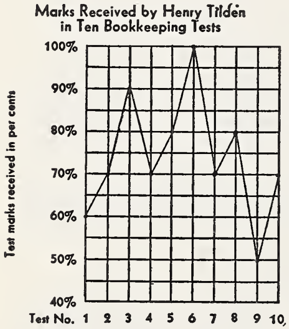
Prepare a vertical bar chart showing this information. Let each division of the vertical scale represent $1,000, and plot each bar to the nearest $500.

4. Construct a horizontal bar chart showing the sales made last year in six departments of the Williston Department Store.

Clothing	$56,364.81	Shoes	$30,691.70
Furniture	47,718.22	Rugs	21,408.44
Dry goods	42,225.15	Notions	10,039.56

If chart paper is used, let each division on the horizontal scale represent $2,000, and plot each bar to the nearest $1,000. If notebook or blank paper is used, lay off each bar to the scale of $\frac{1}{8}$ of an inch for each $2,000. Make each bar accurate to the nearest $1,000.

5. The graph below shows the marks received by Henry Tilden in 10 tests in bookkeeping. Using the information shown on the graph, answer the following questions:



a. What was Henry's mark on test 5?
b. What was the number of the test on which he made the lowest mark?
c. What was the difference between the marks obtained on tests 1 and 5?
d. What was the difference between the marks obtained on tests 4 and 6?
e. Compute Henry's average mark for all ten weeks.

6. During the first six months of the last two years, the Stevenson Department Store made the following sales.

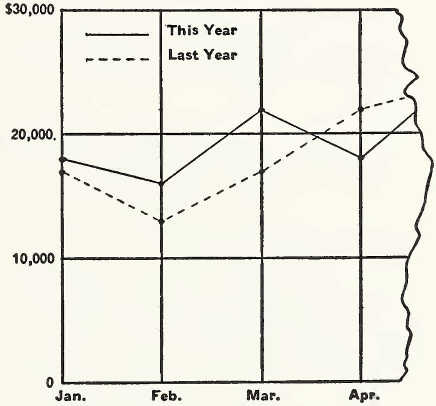
Month	Last Year	This Year
Jan.	$55,280	$62,745
Feb.	48,730	50,945
Mar.	57,820	60,220

Month	Last Year	This Year
April	$57,180	$56,740
May	56,375	51,935
June	50,820	54,265

Construct a curved-line chart showing the sales for each six-month period. Use a red line for the sales of this year; a black line for the sales of last year. If no red pencil is available, use a solid pencil line for the sales of this year and a dotted line for last year.

If chart paper is used, space the vertical lines representing the months half an inch apart. Let each vertical division represent $2,000, and plot each month's sales to the nearest $1,000.

If notebook or blank paper is used, draw a horizontal base line, or zero line, with your ruler. Then draw six vertical lines, one for each month, one half inch apart. Draw a horizontal line across the chart at each $10,000 division point. On the vertical lines, measure off each month's sales for last year to the nearest $1,000, allowing $\frac{1}{16}$ of an inch for each $1,000. Connect the plotted points with a dotted pencil line (or solid black line). In like manner, measure off each month's sales for this year and connect the plotted points with a solid pencil line (or red line). A portion of a curved-line chart constructed in this manner is shown in the illustration above at the left.



7. Using the title and information given below, prepare a curve or broken-line graph to show the facts.

Empire Motion Picture Theater Receipts for Dec. 4–10, 19--

Sunday	$650
Monday	240
Tuesday	270
Wednesday	210
Thursday	180
Friday	390
Saturday	560

8. Prepare a rectangle chart, constructed vertically, to show the information in the table at the right, taken from the records of the Dixie Confectionery Store. The figures show the composition of each $1.00 worth of sales.

Cost of Merchandise Sold	$ .60
Operating Expenses	.23
Net Profit	.17
Sales	$1.00

Make the rectangle an inch and a half wide. If chart paper is used, let each vertical division represent $.02. If notebook or blank paper is used, let each eighth of an inch represent $.02, or each sixteenth $.01, in laying off the vertical dimensions of the sections.

9. Prepare a rectangle chart, constructed vertically, to show the information in the table at the right, taken from the records of the Wellington Sales Company.

If chart paper is used, let each vertical division represent 2%. If notebook or blank paper is used, let each sixteenth of an inch represent 2%.

Cost of Merchandise Sold	62%
Operating Expenses	28%
Net Profit	10%
Sales	100%

10. The sales last year in the four departments of the Crocker Stationery Store were as follows:

Novelties	20%	Greeting cards	25%
Stationery	50%	Candy	5%

(a) If a circle chart is constructed to show the total sales, how many degrees should be used to represent the sales of each department? (b) Construct a circle chart showing the percentage of each department.

11. A certain family of four budgets its monthly income of $300 in the following manner:

Food	$90	Benevolences	$16
Household	90	Family welfare	10
Clothing	54	Savings	24
Recreation	16		

(a) Find the per cent of the monthly income allotted for each expenditure. (b) Construct a circle chart showing each expenditure and its percentage.

Problems for Application and Review

1. (a) Subtract 116.405 from 487.2. (b) Divide $1\frac{3}{5}$ by $1\frac{1}{3}$. (c) Add: 873.1; 11.962; 429.53; 1,587.41. (d) Find the due date of a 90-day note dated April 21. (e) Find the interest on $425 for 53 days at 6%. (f) What amount is 110% greater than $50?

2. Copy and complete the following payroll. Assume that 8 hours constitute a day's work and that time and a half is paid for time worked in excess of 8 hours on any day.

NAME	TIME RECORD						HOUR RATE	TOTAL HOURS		TOTAL WAGES
	M	T	W	T	F	S		REGULAR	OVERTIME	
P. G. Decker	8	8	8½	7	8		$1.80	?	?	?
D. H. Lang	7	9	8	8	9		2.05	?	?	?
C. J. Hiles	8	6½	8	8	8½		1.94	?	?	?
									Total	?

3. Prepare a change sheet and a change memorandum, like those shown on pages 370 and 371, for the following payroll of Paige and Lewis: H. A. Hodge, $74.57; G. E. Lane, $87.92; S. J. Myers, $69.43; E. F. Sherry, $91.37.

4. The money to be raised by local taxes in a certain village is $272,783. The assessed valuation of the property is $14,650,000. Find the tax rate per $1,000 of assessed valuation. (Carry to five decimal places.)

Cumulative Review

1. Mr. Moore's bank statement as of October 31 showed a bank balance of $1,347.50. His checkbook balance was $1,512.95. Checks were outstanding for $36.30, $13.40, and $24.60. A deposit of $152.25, mailed on October 31, was not recorded on the bank statement, and Mr. Moore discovered a check for $87.50 that had been paid but had not been recorded in the checkbook. Prepare a reconciliation statement.

2. If a sales clerk receives a salary of $45 a week and a commission of 3% on all sales in excess of $750 in any single week, what must be the amount of his sales each week in order that his total weekly earnings may be $60?

3. Richman, a real estate broker, sold a house for a client for \$12,500. If 5% commission was charged on the transaction, what amount of money did the client receive as net proceeds of the sale?

4. If the interest on a loan of \$180 for 15 months is \$15.75, what is the rate of interest?

5. You wish to borrow \$100. If you borrow \$100 from a bank and pay \$25 each month on the principal, the total interest and bank charges will be \$4. A loan company will lend you \$100, charging 3% each month on the unpaid balance. (a) If you borrow \$100 from the loan company and pay \$25 each month on the principal, what will be the total interest cost for the four months? (b) Which concern charges the larger amount? (c) How much larger?

6. A savings bank pays interest on its deposits at the rate of 2% a year and adds the interest to the balance on the first of January, April, July, and October. After interest was recorded on April 1, 1948, a depositor's balance was \$340. On that day he deposited \$250. On July 1 he withdrew \$150 and on October 1 he deposited \$200. (a) What was his balance on April 1, 1949? (b) What was his total interest for the year?

7. What is the rate of income on a $2\frac{1}{4}$% bond purchased at 90?

8. What amount must be invested in Ohio Edison 3% bonds at $106\frac{3}{4}$ in order to produce an annual income of \$1,500?

9. F. J. Burke bought 200 shares of stock at $65\frac{7}{8}$ plus a brokerage fee of \$32.59 for each 100 shares. He received three quarterly dividends of $62\frac{1}{2}$¢ each per share and an extra year-end dividend of 25¢ per share, and then sold the stock at $63\frac{3}{4}$. Expenses incurred in the selling of the stock consisted of brokerage fees totaling \$64.76 and taxes amounting to \$20.26. What was Burke's net gain or loss on the entire transaction?

10. On December 31, C. B. Franklin purchased a house for \$5,600, on which amount he had been receiving 3% interest. The house was immediately rented for \$60 a month. On the following May 1, the tenant left, and Mr. Franklin spent \$140 for repairs. On July 1, he leased the house for the remainder of the year for \$75 a month. Additional expenses incurred during the year were: insurance, \$30; taxes, \$116; depreciation, 2%. How much did Mr. Franklin's investment increase his net income over the previous year?

11. Norton bought a house for \$11,500, paying \$3,500 in cash and giving a 5% mortgage for the balance. He rented the house for \$125 a month. If the annual expense for taxes was \$410, insurance \$28, and repairs and depreciation \$445, what rate of return did Norton realize on his investment?

12. Porter is considering the purchase of a house which rents for \$75 a month and which may be bought by giving a $4\frac{1}{2}\%$ mortgage for \$6,000 and cash for the balance. Annual expenses, in addition to interest on the mortgage, amount to \$500. Assuming that the rent income and the expenses remain the same, how much can Porter afford to pay for the house so that he may earn 5% on his investment?

13. H. L. Willis is the proprietor of a retail clothing store. He has the opportunity of either renting a certain building at \$225 a month or buying the building at \$22,000. In case he purchases it, Willis estimates the annual expenses will be as follows: taxes, \$480; repairs and depreciation, \$500; insurance, \$135. He considers that his money is worth 6% to him in his business. (a) Which will be cheaper for Willis, to buy the building or to rent it? (b) How much would be saved annually?

14. Dawson's annual fuel oil bill averaged 2,000 gallons at 12.5¢ a gallon. He had his house insulated at a cost of \$720. Assuming that the insulation will decrease his annual fuel cost by 24%, in how many years should the reduction in fuel cost amount to the cost of the insulation?

15. Garnsey owns a house and lot assessed at \$9,500 and a vacant lot assessed at \$750. The real estate tax in his community for last year was \$32.60 per \$1,000. What was the total amount of Garnsey's tax bill for last year on this property?

16. Frank Horton has a fire insurance policy for \$5,000 on his store building with the Star Insurance Company and another policy for \$7,000 on the same building with the Comet Insurance Company. A fire in the building caused a loss of \$7,224. Calculate the amount of this loss that will be paid by the Star Insurance Company, assuming that losses are shared proportionately between the two companies.

17. Moulton's electric meter read 8,412 kilowatt-hours on April 1 and 8,560 kilowatt-hours on May 1. If Moulton was charged $4\frac{1}{2}$¢ per kilowatt-hour for electricity, what was the amount of his bill for the month of April?

18. In a community with a total assessed valuation of \$1,250,000 a real estate tax of \$39,375 is to be raised. What tax rate per \$1,000 will be necessary to collect this amount of money?

19. Townsend's monthly telephone bill amounted to a total of \$4.83. This included a Federal tax of 15% which had been added to the original amount of the bill. What was the original amount of the bill?

20. Bentley works on a 40-hour-per-week basis with time and a half for overtime. During a recent week he worked 46 hours. His regular hourly pay rate was $1.20. Deductions from his total earnings amounted to $14.86. What amount of money did Bentley receive after all deductions had been made?

21. Bishop's state income tax return for a certain year showed a net taxable income, after all deductions had been made, of $3,864. This income was subject to a tax of 2% on the first $1,000, 3% on the next $2,000, and 4% on the next $2,000 or any fraction thereof. What was the total of Bishop's state income tax for that year?

22. The records of G. A. Miller, a druggist, show the following for the month of June: merchandise inventory, June 1, $8,750; merchandise inventory June 30, $8,890; sales, $4,810; purchases, $3,284; operating expenses, $1,080. Find (a) the cost of goods sold for the month and (b) the net profit.

23. On an invoice of $3,460, Martin & Company are offered three months' credit or a discount of 5% for cash. Not having the ready money, they accept the credit terms. How much would they have saved if they had borrowed the money at 6% and paid cash?

24. By taking the 5% discount offered on a bill of goods, a merchant saved $43.21. Find the face of the bill before the discount was deducted.

25. The discount of 2% on an invoice of goods is $12.50. What is the net cost?

26. If $1,091.25 represents the amount of an invoice less 3% discount, what is the amount of the invoice?

27. An article costing $60 is marked $33\frac{1}{3}$% above cost. What rate of discount may the seller allow on the marked price and still make a profit of 20% on the cost?

28. If a retailer wishes to receive $232.75 for an article after allowing the customer a discount of 5%, what should be the marked price of the article?

29. An article that cost $4.50 has been selling for $7.50 at the rate of 8 articles a day. During a special sale, the price was reduced to $6.30, whereupon sales increased to 15 a day. Find the per cent increase or decrease in the daily profit.

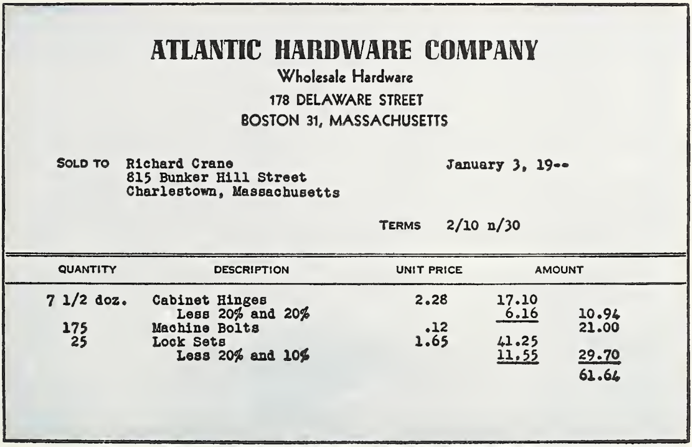
UNIT XI

PROBLEMS OF THE WHOLESALER

Many producers sell their products in large quantities to wholesalers, who in turn sell in smaller lots to other wholesalers or retailers. Many of the problems of the wholesaler are similar to those of the retailer. A few problems, however, are peculiar to the wholesaler or occur more often in a wholesale business.

Section 1 . . Sales Invoice

Use of the Sales Invoice. Upon filling an order from a customer, the wholesaler mails the customer an invoice, which is an itemized statement of the quantity and price of each item shipped. The illustration below shows the invoice that the wholesaler, the Atlantic Hardware Company, sent to Richard Crane, a retailer.



ATLANTIC HARDWARE COMPANY
Wholesale Hardware
178 DELAWARE STREET
BOSTON 31, MASSACHUSETTS

SOLD TO Richard Crane
815 Bunker Hill Street
Charlestown, Massachusetts

January 3, 19--

TERMS 2/10 n/30

QUANTITY	DESCRIPTION	UNIT PRICE	AMOUNT	
7 1/2 doz.	Cabinet Hinges	2.28	17.10	
	Less 20% and 20%		6.16	10.94
175	Machine Bolts	.12		21.00
25	Lock Sets	1.65	41.25	
	Less 20% and 10%		11.55	29.70
				61.64

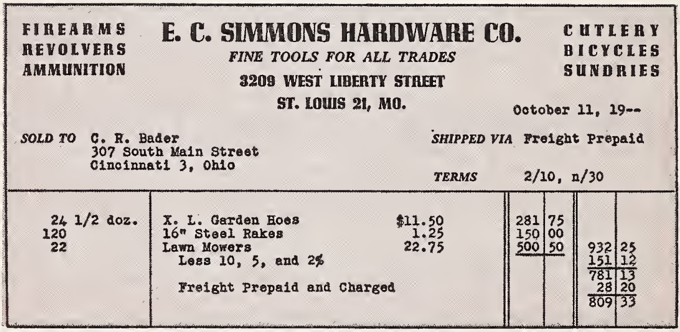
Invoice

The sales invoice is prepared by the billing clerk in the office of the wholesaler. It is usually made out either on a typewriter or on a billing machine. In the same operation, one or more additional copies are made by means of carbon paper. The original copy of the invoice is sent to the customer. The carbon copies are retained in the office of the wholesaler for use in compiling the bookkeeping records.

Exercise 1. (*Written*)

1. The E. C. Simmons Hardware Co. sold merchandise to C. R. Bader as shown in the invoice illustrated below. (a) Verify the extensions, the trade discount, and the total amount of the invoice. (b) Find the amount of the check drawn in payment of the invoice if the invoice is paid on October 20.

> Cash discount is calculated on the invoice price, or net price, after deducting the trade discounts. If freight, express charges, or a charge for sales tax appears on the invoice, the cash discount is calculated on the net amount before the addition of these charges.



FIREARMS
REVOLVERS
AMMUNITION

E. C. SIMMONS HARDWARE CO.
FINE TOOLS FOR ALL TRADES
3209 WEST LIBERTY STREET
ST. LOUIS 21, MO.

CUTLERY
BICYCLES
SUNDRIES

October 11, 19--

SOLD TO C. R. Bader
307 South Main Street
Cincinnati 3, Ohio

SHIPPED VIA Freight Prepaid

TERMS 2/10, n/30

24 1/2 doz.	X. L. Garden Hoes	$11.50	281 75	
120	16" Steel Rakes	1.25	150 00	
22	Lawn Mowers	22.75	500 50	932 25
	Less 10, 5, and 2%			151 12
				781 13
	Freight Prepaid and Charged			28 20
				809 33

2. On April 28, your employer, the Johnson Paint Company, sold the following paint to R. E. Anderson, a retailer; terms 2/10, 1/30, n/90.

24 gal. House Paint @ $4.25
36 gal. Roof Paint @ $3.25
56 qt. Varnish @ $2.15
64 gal. Shingle Stain @ $1.95
20 gal. Gloss Enamel @ $4.50

This paint was billed at the prices mentioned less trade discounts of 10% and 10%, with $12.68 added to the invoice for freight charges prepaid by the Johnson Paint Company. The invoice was paid by check on the 10th of the following month. What was the amount of the check?

3. The following items were sold by A. C. Ward & Company to the Smith Department Store on an invoice dated August 27; terms 2/10, n/30.

4 pieces gingham $29\frac{1}{4}$ yd., $32\frac{3}{8}$ yd., $31\frac{5}{8}$ yd., $29\frac{3}{4}$ yd. @ $.96
4 pieces prints $25\frac{7}{8}$ yd., $29\frac{3}{4}$ yd., $27\frac{3}{8}$ yd., $28\frac{1}{4}$ yd. @ $.72
4 pieces linings 32 yd., $28\frac{3}{4}$ yd., 29 yd., $31\frac{1}{2}$ yd. @ $.82

(a) Make the extensions and find the total amount of the invoice. (b) Find the due date of the invoice. (c) What amount should A. C. Ward & Company receive in payment of the invoice if payment is made within the discount period?

4. Lutz & Company, a wholesale dry goods firm, sells the goods listed below to B. T. Frank & Sons. The invoice is dated June 26 and the terms are 2/10, 1/20, n/60. (a) What is the amount of the invoice? (b) What amount should Lutz & Company receive in payment of the invoice if payment is made on July 15?

5 pieces prints	31^1, 30^2, 32, 30^6, 29^3	@	$ .76
5 pieces chambray	34, 32^4, 37^1, 35^3, 34^2	@	.65
4 pieces taffeta	27^1, 31^6, 29^2, 30^4	@	1.47
4 pieces percale	26^2, 28^1, 30, 27^1	@	.47

The figures after each item refer to the number of yards in each piece. The small figures indicate eighths of a yard; that is, $^1 = \frac{1}{8}$ of a yard; $^2 = 2/8$, or $\frac{1}{4}$, of a yard; $^3 = \frac{3}{8}$ of a yard; etc. Thus, $31^1 = 31\frac{1}{8}$ yards; $29^5 = 29\frac{5}{8}$ yards; 32^6 or $32\frac{3}{4}$; yards.

ALIQUOT PARTS (Concluded)

Aliquot Parts of 10, 100, and 1,000. In an earlier unit you learned the method of multiplying a number by an aliquot part of 10¢, $1, $10, etc. The same method may be applied in multiplying by an aliquot part of 10, 100, 1,000, etc.

For example, the first item listed in the invoice on page 385 is $7\frac{1}{2}$ doz. Cabinet Hinges @ $2.28. The quantity, $7\frac{1}{2}$, is $\frac{3}{4}$ of 10. In this case, 10 is the *base*; and $\frac{3}{4}$ is the *fractional equivalent* of $7\frac{1}{2}$ in relationship to the base, 10. Hence, to find the total cost, we may multiply the unit price, $2.28, by the base and the fractional equivalent of the quantity, rather than multiply by the quantity itself.

Example: Find the cost of $7\frac{1}{2}$ doz. Cabinet Hinges at $2.28.

Solution

Method 1	*Method 2*
$7\frac{1}{2} \times \$2.28 = ?$	$7\frac{1}{2} \times \$2.28 = ?$
Since $7\frac{1}{2} = \frac{3}{4}$ *of 10,*	*Since* $7\frac{1}{2} = \frac{3}{4}$ *of 10,*
the problem becomes	*the problem becomes*
$\frac{3}{4} \times 10 \times \$2.28 = ?$	$\frac{3}{4} \times 10 \times \$2.28 = ?$
$\frac{3}{4} \times \$2.28 = \$1.71$	$10 \times \$2.28 = \$22.80$
$10 \times \$1.71 = \$17.10$. *Ans.*	$\frac{3}{4} \times \$22.80 = \$17.10$. *Ans.*

When the multiplication is to be performed mentally, the numbers can often be held in mind more easily by Method 1.

Table of Aliquot Parts of 10, 100, and 1,000. Some of the more frequently used aliquot parts of 10, 100, and 1,000 are shown in the following table.

ALIQUOT PARTS OF 10, 100, AND 1,000

BASE	FRACTIONAL EQUIVALENT										
	$\frac{1}{2}$	$\frac{1}{4}$	$\frac{3}{4}$	$\frac{1}{8}$	$\frac{3}{8}$	$\frac{5}{8}$	$\frac{7}{8}$	$\frac{1}{3}$	$\frac{2}{3}$	$\frac{1}{6}$	$\frac{5}{6}$
10	5	$2\frac{1}{2}$	$7\frac{1}{2}$	$1\frac{1}{4}$	$3\frac{3}{4}$	$6\frac{1}{4}$	$8\frac{3}{4}$	$3\frac{1}{3}$	$6\frac{2}{3}$	$1\frac{2}{3}$	$8\frac{1}{3}$
100	50	25	75	$12\frac{1}{2}$	$37\frac{1}{2}$	$62\frac{1}{2}$	$87\frac{1}{2}$	$33\frac{1}{3}$	$66\frac{2}{3}$	$16\frac{2}{3}$	$83\frac{1}{3}$
1,000	500	250	750	125	375	625	875				

Exercise 2. (*Oral*)

In each of the following problems, recite the solution and give the product of the indicated multiplication. For example, the recited solution of Problem 1-a would be one of the following:

$2\frac{1}{2}$ equals $\frac{1}{4}$ of 10	$2\frac{1}{2}$ equals $\frac{1}{4}$ of 10
$\frac{1}{4}$ times \$.48 = \$ .12	10 times \$ .48 = \$4.80
10 times \$.12 = \$1.20	$\frac{1}{4}$ times \$4.80 = \$1.20

	1.	2.	3.	4.
a.	$2\frac{1}{2}$ @ \$.48	500 @ \$.46	$6\frac{1}{4}$ @ \$.72	$33\frac{1}{3}$ @ \$ .66
b.	25 @ .16	$1\frac{1}{4}$ @ .96	$62\frac{1}{2}$ @ .56	$6\frac{2}{3}$ @ .36
c.	250 @ .12	$12\frac{1}{2}$ @ .72	625 @ .24	$66\frac{2}{3}$ @ .27
d.	$7\frac{1}{2}$ @ .32	125 @ .48	$8\frac{3}{4}$ @ .64	$1\frac{2}{3}$ @ 1.26
e.	75 @ .48	$3\frac{3}{4}$ @ .56	$87\frac{1}{2}$ @ .80	$16\frac{2}{3}$ @ 2.40
f.	750 @ .16	$37\frac{1}{2}$ @ .32	875 @ .32	$8\frac{1}{3}$ @ .18
g.	50 @ .64	375 @ .16	$3\frac{1}{3}$ @ .39	$83\frac{1}{3}$ @ .42

Exercise 3. (*Oral*)

For each of the following problems, recite the solution and give the product of the indicated multiplication.

	1.	2.	3.	4.
a.	12½ @ $1.28	87½ @ 24¢	83⅓ @ 36¢	62½ @ $.24
b.	33⅓ @ $1.08	75 @ $.44	37½ @ $.48	125 @ 12¢
c.	62½ @ 88¢	250 @ 92¢	12½ @ 36¢	750 @ $1.20
d.	125 @ $.16	50 @ $2.98	25 @ 93¢	250 @ $16
e.	25 @ $3.60	750 @ $3.20	125 @ 65¢	125 @ 28¢

Combinations of Aliquot Parts of 10, 100, and 1,000. The quantity on an invoice is sometimes a combination of an aliquot part and the base.

For example, on the invoice shown on page 385, the quantity of the second item is 175. 175 is equivalent to 100 + 75. Since 75 is ¾ of 100, 175 is equivalent to 100 + ¾ of 100. The quantity is therefore equivalent to the base plus a fractional part of the base.

Some of the frequently occurring combinations of aliquot parts of 10, 100, and 1,000 are the following:

12½ = 10 + ¼ of 10
15 = 10 + ½ of 10
125 = 100 + ¼ of 100
150 = 100 + ½ of 100
175 = 100 + ¾ of 100
1,250 = 1,000 + ¼ of 1,000
1,500 = 1,000 + ½ of 1,000
1,750 = 1,000 + ¾ of 1,000

The method of multiplication by aliquot parts may be applied to multiplication by combinations of aliquot parts. Thus, the computation of the cost of 175 Machine Bolts at $.12 would be:

175 = 100 + ¾ of 100
100 × $.12 = $12
¾ × $12 = $9
$12 + $9 = $21. *Ans.*

Exercise 4. (*Oral*)

For each of the following problems, recite the solution and give the product of the indicated multiplication.

	1.	2.	3.	4.
a.	12½ @ $ .28	150 @ $8.50	1,250 @ $ .42	1,500 @ 33¢
b.	125 @ $4.40	1,500 @ $ .17	15 @ $1.30	175 @ $ .88
c.	1,250 @ $ .84	175 @ $16	1,750 @ 44¢	12½ @ $3.60
d.	15 @ $2.60	1,750 @ $ .24	125 @ $1.20	150 @ $4.50

Problems for Application and Review

Group A

1. (a) Find $4\frac{1}{6}\%$ of \$450. (b) \$9 is 28% less than what amount? (c) Find the due date of a 90-day note dated January 10. (d) Find the number of days from April 2 to September 15. (e) Find the interest at 6% on \$850 for 126 days.

2. A clothier sold a coat for \$60 at a profit of $\frac{3}{5}$ of the cost. Find the cost.

3. A gas range is billed to the dealer at \$141.75, less $33\frac{1}{3}\%$. He desires to make a profit of 20% on the cost and to offer a 10% discount during a special sale. At what price must the range be marked?

4. A grocer purchased 14 crates of oranges (96 to a crate) at \$4.45 a crate. He paid \$3.82 for freight and cartage on the shipment. At what price per dozen should he sell the oranges in order to make a profit of 25% of the total cost?

5. Pencils that cost \$3.24 a gross are sold at 3¢ each. Find the gain per cent on the cost.

Group B

1. (a) Divide $8\frac{1}{3}$ by $12\frac{1}{2}$. (b) Express $.07\frac{1}{2}$ as a common fraction. (c) Find the due date of a 75-day note dated July 12. (d) Find the number of days from March 15 to July 20. (e) Find the interest at 3% on \$675 for 130 days.

1.3%

2. To the nearest tenth per cent, what should be the per cent markup on the cost of a wardrobe trunk in order to realize a gross profit of 38% on the selling price?

3. Pencils bought at \$1.80 a gross were sold at 2¢ each. What per cent of the selling price was gained?

4. On January 12, C. J. Taylor, a retail merchant, purchased a bill of goods listed at \$7,520, less 10% and 5%; terms 2/10, n/60. If he paid the bill on January 22, what was the amount of the check he drew to make the payment?

5. The following items were purchased by F. H. Joslin & Company on an invoice dated May 15, terms 90 days:

5 pc. corduroy	38, 37^4, 41^2, 45^3, 41^5	@ \$1.75
5 pc. tweed	38^5, 40, 37^1, 41, 43^2	@ $3.62\frac{1}{2}$
5 pc. velveteen	39^3, 41, 45^4, 38^2, 35^7	@ $2.37\frac{1}{2}$

Find the amount of the invoice.

Group C

1. (a) Multiply 45$\frac{2}{3}$ by 27$\frac{3}{5}$. (b) \$12.60 is $\frac{7}{20}$ of what amount? (c) Find the due date of a 120-day note dated March 13. (d) Find the number of days from June 16 to October 29. (e) Find the interest on \$585 for 140 days at 5%.

2. What is the highest price per pair a shoe dealer should pay for shoes that retail at \$13.95 if he desires to make a profit of 55% on the cost?

3. A retailer buys traveling bags at \$27.20 each, less 25%. At what price must he mark them to make a profit of 20% on the selling price after allowing an advertised discount of 15%?

4. A department store has just bought towels at \$3.12 a dozen. Find the selling price of each towel if the gain is to be 33$\frac{1}{3}$% of the selling price.

5. On June 2 a merchant bought a bill of goods amounting to \$8,276.40, less 20% and 5%, terms 2/10, n/30. How much will he gain by borrowing money on June 12 at 6% and taking advantage of the cash discount?

6. Find the single discount that is equal to a series of discounts of 20%, 10%, and 5%.

Group D

1. (a) What number divided by 6$\frac{1}{4}$ gives 4$\frac{1}{2}$? (b) \$21.60 is 35% more than what amount? (c) Find the due date of an 80-day note dated July 3. (d) Find the sum of 16$\frac{3}{4}$, 9$\frac{3}{8}$, and 7$\frac{5}{12}$. (e) Find the interest at 4% on \$370 for 150 days.

2. A profit of 40% on the selling price is equivalent to what rate of profit on the cost?

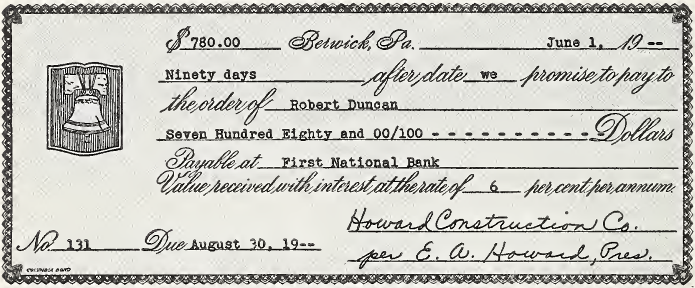
3. A merchant buys one dozen hats at \$28 a dozen and pays \$1.55 express charges on the shipment. (a) Find the cost of each hat delivered. (b) At what price must each hat be sold to gain 30% on this cost?

4. Coats that cost \$15.75 had been selling for \$24.75 at the rate of 5 a day. When the price was reduced to \$21, the sales increased to 10 a day. (a) Was the amount of daily profit increased or decreased by the reduction in price? (b) What per cent did the dealer gain or lose by the reduction in price?

5. At what price should a retailer mark an article in order that he may receive \$33 for it after allowing an advertised discount of 20%?

Section 2 . . . Promissory Notes and Partial Payments

Use of Promissory Notes. In a few lines of business, wholesalers and manufacturers require the customer either to make immediate cash payment or to sign a promissory note for the amount of his purchase. The following illustration, for example, shows the 90-day, interest-bearing note for $780 that the Howard Construction Company signed and gave to Robert Duncan, wholesale equipment merchant, in settlement of a purchase of construction machinery. The terms of the sale to the Howard Construction Company were: *90-day, 6% note.*



$780.00 Berwick, Pa. June 1, 19--

Ninety days after date we promise to pay to

the order of Robert Duncan

Seven Hundred Eighty and 00/100 - - - - - - - - - - Dollars

Payable at First National Bank

Value received with interest at the rate of 6 per cent per annum.

Howard Construction Co.

No. 131 Due August 30, 19-- per E. A. Howard, Pres.

Interest-Bearing Note

In cases where merchandise is sold on account and the customer is unable to pay the invoice at the end of the credit period, the seller may grant an extension of time by accepting the customer's promissory note for the amount of the debt. The note serves as the customer's written acknowledgment of the amount owed to the seller and fixes a definite time for its payment. Usually, though not always, the note is interest-bearing.

Collection and Payment of Notes. A business firm usually makes collection on a customer's note through the bank where the firm is a depositor. For example, in the case of the note shown above, Robert Duncan made collection through his bank, the Central Bank & Trust Company, in the following manner:

(1) A few days before the due date, August 30, Duncan took the note to the Central Bank & Trust Company and endorsed it to the bank "for collection and credit."

(2) The Central Bank & Trust Company immediately forwarded the note to the First National Bank of Berwick, where the Howard Construction Company is a depositor and where the note was payable.

(3) On August 30, the First National Bank of Berwick charged the amount of the note and interest, $791.70, to the Howard Construction Company's checking account, in the same manner as a check issued by the company, and remitted the amount to the Central Bank & Trust Company.

(4) The Central Bank & Trust Company then credited the amount of the remittance to Duncan's checking account.

Exercise 5. (Written)

1. On March 10, Dixon & Son placed with their bank, for collection and credit, the 90-day, 5% note of a customer, C. N. Hines. On March 15, the date of maturity, the bank obtained collection of the total amount due and credited it to Dixon & Son's checking account. What was the amount credited to Dixon & Son's account if the face of the note was $675.50?

2. On December 1, George Elliott's bank statement showed a balance of $718.54. His checkbook balance was $672.40. The following items appeared on the bank statement but not in the checkbook: $56 note collection; $1.78 service charge. A deposit of $135.75 made on November 30 appeared in the checkbook but not on the bank statement. The following checks were outstanding: $46.50; $24.58; $17.65; $38.94. Prepare a reconciliation statement.

3. On December 1, A. B. Browne's bank statement showed a balance of $1,245.27. His checkbook balance on that date was $1,089.54. The following checks were outstanding: $125.10; $59.05; $118.08. Comparing the statement with the checkbook, Browne discovered that the following items had not been recorded in the checkbook: a service charge of $1; a note for $145.50 paid by the bank and charged to his account. Reconcile the balances.

Partial Payments. Sometimes the maker of a note pays a part of the note before the date of maturity. Such payments are referred to as partial payments. If partial payments are made, the one receiving payment records the date and amount of each payment on the back of the note.

When one or more partial payments have been made on a note, the amount due at maturity is determined by either of two methods: (1) the United States Rule or (2) the Merchants' Rule.

United States Rule. The procedure used in calculating the amount due on a note by the *United States Rule* is as follows:

(1) To the face of the note, add the interest for the time between the date of the note and the date of the first payment.
(2) Deduct the first partial payment.
(3) To the new balance, add the interest for the time between the first and second partial payments.
(4) Deduct the second partial payment.
(5) Continue this process until the date of settlement.

In cases where the payment is less than the interest, the amount of the payment should be carried over and added to the next payment.

Example: On a 6% note for $2,500, dated March 15, the following payments were made: April 14, $50; June 24, $25; August 4, $150. What was the net amount due on September 11, the date of final settlement?

Solution

Face of note		*$2,500.00*
Interest on $2,500—March 15 to April 14 (30 days)		*12.50*
Amount due, April 14		*$2,512.50*
Payment, April 14		*50.00*
Balance, April 14		*$2,462.50*
Interest on $2,462.50—April 14 to June 24 (71 days)		*29.14*
The payment of $25.00 on June 24, being insufficient to cover this interest, is carried over and added to the next payment.		
Interest on $2,462.50—June 24 to August 4 (41 days)		*16.83*
Amount due, August 4		*$2,508.47*
Payments:		
June 24	*$ 25.00*	
August 4	*150.00*	*175.00*
Balance, August 4		*$2,333.47*
Interest on $2,333.47—August 4 to Sept. 11 (38 days)		*14.78*
Amount due, September 11		*$2,348.25*

Exercise 6. (Written)

1. On a note for $1,400 dated March 9, 1954, and bearing interest at 6%, the following payments were made: May 12, 1954, $413.50; September 21, 1954, $275. Find the amount due on January 17, 1955, the date of final settlement.

2. On September 6, 1954, D. B. Weber gave a note for $2,500 at 6% interest. He made payments as follows: January 17, 1955, $600; May 10, 1955, $850. What was the amount due on the date of final settlement, June 6, 1955?

3. A note for $2,000, dated April 5, 1954, with interest at 6%, was paid on April 5, 1955. What amount was due on the day of settlement if $800 was paid on August 20, 1954, and $1,000 on February 19, 1955?

4. A note for $750, dated December 15, 1953, with interest at 6%, had the following payments recorded upon it: March 27, 1954, $75; August 17, 1954, $50. What amount was due on January 29, 1955?

Merchants' Rule. The procedure used in calculating the amount due on a note by the Merchants' Rule is as follows:

(1) Calculate the interest on the face of the note from the date of the note to the date of settlement.
(2) Calculate the interest on each partial payment from the date of the payment to the date of settlement.
(3) From the face plus the interest on the face, deduct the sum of the partial payments and the interest on the payments.

Example: Using the Merchants' Rule, find the net amount due on September 11 on the note referred to in the illustrative example on page 394.

Solution

Face of note			*$2,500.00*
Interest from March 15 to Sept. 11 (180 da.)			*75.00*
TOTAL			*$2,575.00*
Payments:			
1. April 14	*$ 50.00*		
Int. from April 14 to Sept. 11 (150 da.)	*1.25*	*$ 51.25*	
2. June 24	*$ 25.00*		
Int. from June 24 to Sept. 11 (79 da.)	*.33*	*25.33*	
3. August 4	*$150.00*		
Int. from Aug. 4 to Sept. 11 (38 da.)	*.95*	*150.95*	
TOTAL			*227.53*
Amount due, September 11			*$2,347.47*

Exercise 7. (*Written*)

Using the Merchants' Rule, find the final amount due in each of the problems in Exercise 6, on pages 394 and 395.

Problems for Application and Review

Group A

1. (a) Express $.03\frac{1}{8}$ as a common fraction. (b) From $46\frac{1}{3}$ subtract $19\frac{5}{6}$. (c) What is the due date of a 70-day note dated December 6? (d) Find the number of days from May 7 to August 28. (e) Find the interest on $490 for 148 days at 7%.

2. A haberdasher buys hats at $80 per dozen, less 25% and 20%. He desires to make a profit of 25% on the cost and offer a discount of $16\frac{2}{3}$% during a special sale. At what price must each hat be marked?

3. In the suit department of Rolfe's Clothing Store, men's suits are marked 55% above cost. What per cent of the selling price is gained, computed to the nearest tenth per cent?

4. Pencils that cost $4.80 a gross are sold at 5¢ each. Find the gain per cent on the cost.

5. A dealer purchases Ranger bicycles for $32.50, less 20% and 5%, plus a freight charge of 90¢ on each bicycle. If he computes his cost of doing business at 24% of sales, for how much must he sell each bicycle in order to make a net profit of 12% on the selling price?

Group B

1. (a) $10.80 is what per cent greater than $4.80? (b) $37.50 is $\frac{2}{5}$ smaller than what amount? (c) Find the number of days from July 22 to November 17. (d) Find the interest at $4\frac{1}{2}$% on $655 for 139 days. (e) What number multiplied by $\frac{2}{3}$ gives 330?

2. A 5% interest-bearing note for $1,800, dated March 4, showed the following payments on the principal: April 13, $400; June 6, $600. What will be the amount due to make final settlement on September 4 under (a) the United States Rule and (b) the Merchants' Rule?

3. What is the most a store owner should pay per dozen for men's shirts that he retails at $4 each if he must realize 60% gross profit on the cost?

4. A box containing 50 packages of envelopes made to retail at 2 packages for 15¢ cost the dealer $2.50. What was the per cent of profit based on the selling price?

Section 3 . . . Bank Discount

Discounting a Customer's Interest-Bearing Note. If a merchant has a customer's note and is in need of the money before the date of maturity, he may sell the note to his bank and receive cash for it. If he does this, he is said to *discount* the note; and the date on which he discounts the note is referred to as the *date of discount.*

The bank will hold the note from the date of discount to the date of maturity and will then collect the amount due, or the maturity value, from the maker of the note. This period of time that the bank is required to hold the note is the *term of discount.* It is the number of days from the date of discount to the date of maturity.

The bank gives the merchant the maturity value of the note less interest on the maturity value for the term of discount. This interest, which the bank deducts from the maturity value, is called *bank discount.* The rate at which the discount is computed is called the *discount rate.* The bank deducts this discount because it will have to wait until the date of maturity before it can collect payment from the maker of the note.

For example, if James Quinn has a customer's 30-day note dated May 1, the maturity date of the note is May 31. If Quinn sells the note to his bank on May 11, which is 20 days before May 31, the bank deducts discount for 20 days, the time it must wait before it can collect the amount from the maker. In this way the bank makes its profit on the transaction.

The amount the merchant receives for the note, which is the maturity value less the bank discount, is called the *proceeds.*

The steps in computing the proceeds are as follows:

(1) Find the date of maturity.
    The date of the note plus the time specified in the note.

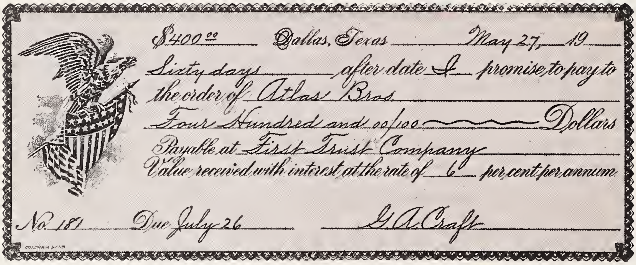
(2) Find the value at maturity.
    The face of the note plus interest on the face at the rate and for the time specified in the note.

(3) Find the term of discount.
    The number of days from the date of discount to the date of maturity.

(4) Find the bank discount.
    The interest at the discount rate on the value at maturity for the term of discount.

(5) Find the proceeds.
    The value at maturity less the bank discount.

Example: Atlas Brothers receive from G. A. Craft the note illustrated below. On June 11, they discount the note at 6% at the Merchants National Bank. What are the proceeds received by Atlas Brothers on June 11?



$\$400^{00}$ Dallas, Texas May 27, 19
Sixty days after date I promise to pay to
the order of Atlas Bros.
Four Hundred and 00/100 Dollars
Payable at First Trust Company
Value received with interest at the rate of 6 per cent per annum
No. 181 Due July 26 G. A. Craft

Solution

(1) Date of maturity; 60 da. after May 27 = July 26

(2) Value at maturity = $404.00

Face of note	*$400.00*
Int. on $400 for 60 da. @ 6%	*4.00*
Value at maturity	*$404.00*

(3) Term of discount; June 11 to July 26 = 45 da.

(4) Bank discount; int. on $404 for 45 da. @ 6% = $3.03

(5) Proceeds = $400.97 Ans.

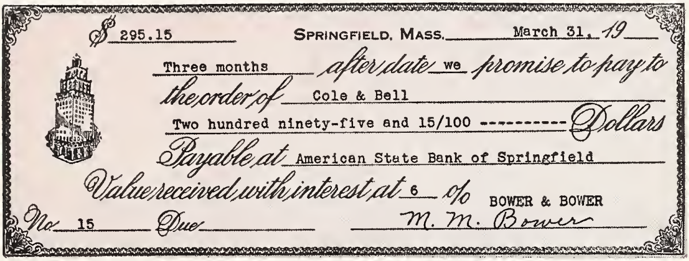
Value at maturity	*$404.00*
Bank discount	*3.03*
Proceeds	*$400.97*

Exercise 8. (*Written*)

1. Find the proceeds for each of the following notes.

	Face	Interest Rate	Date of Note	Time of Note	Discount Date	Discount Rate
a.	$ 780	6%	Mar. 2	60 da.	Mar. 22	6%
b.	1,560	6%	July 18	30 da.	July 22	6%
c.	840	6%	Aug. 28	45 da.	Sept. 3	6%
d.	975	6%	June 20	60 da.	July 1	6%
e.	765	6%	Oct. 14	3 mo.	Nov. 26	6%
f.	1,275	6%	May 28	2 mo.	July 3	6%
g.	570	6%	Sept. 4	4 mo.	Oct. 11	6%

2. Find the proceeds of the following note that was discounted by Cole & Bell on May 12 at 6%.



$295.15 SPRINGFIELD, MASS. March 31, 19

Three months after date we promise to pay to the order of Cole & Bell

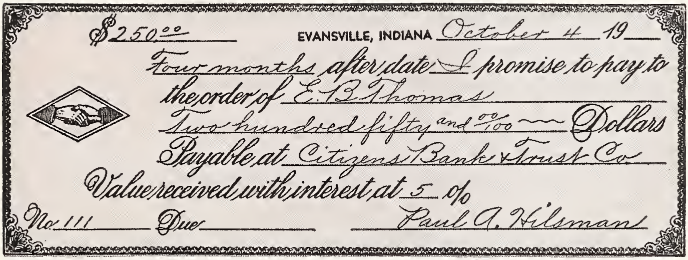
Two hundred ninety-five and 15/100 ---------- Dollars

Payable at American State Bank of Springfield

Value received with interest at 6 % BOWER & BOWER

No. 15 Due M. M. Bower

3. Find the proceeds of the note shown below, which was discounted by E. B. Thomas on December 1 at 6%.



$250.00 EVANSVILLE, INDIANA October 4 19

Four months after date I promise to pay to the order of E. B. Thomas

Two hundred fifty and 00/100 Dollars

Payable at Citizens Bank & Trust Co.

Value received with interest at 5 %

No. 111 Due Paul A. Hilsman

4. C. F. Jones is the owner of a 3-month, 6% note, made in his favor for $1,500, and dated November 23. How much does Jones receive for the note if he discounts it at 6% on January 19?

5. On June 12, Henry Austin found that he had overdrawn his bank account by $154.20. On that date he discounted at 6% a three-month, 6% note for $280, dated May 26. (a) Find the proceeds of the note. (b) What was Austin's bank balance after the proceeds were credited to his account?

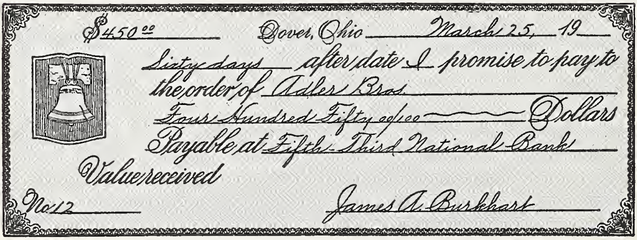
6. A firm had bills amounting to $1,275.50 to pay on January 5. Their checkbook balance was $1,020.30. To raise additional funds, the firm discounted on January 4 Harry Brown's 60-day interest-bearing note for $500, dated December 20. (a) Find the proceeds of the note. (b) What was the firm's balance on January 5, after the bills had been paid?

When the rate of interest or rate of discount is not stated, assume that the rate is 6%.

7. On October 1, a company gave its 90-day note, bearing interest at 6%, for $825 in payment of an invoice. In order to secure the necessary funds to meet the note, the company discounted on December 30 a customer's two-month note for $960, dated November 23, and bearing interest at 6%. (a) How much was due on December 30 on the company's note given in payment of the invoice? (b) What amount did the company receive from the discounted note? (c) How much cash remained after the company's note was paid?

Discounting a Customer's Non-Interest-Bearing Note. The method of computing the proceeds of a customer's non-interest-bearing note is similar to the method outlined on page 397 for computing the proceeds of an interest-bearing note. However, since a non-interest-bearing note does not bear interest, the value at maturity is the same amount as the face of the note. Hence, in computing the proceeds no calculations are necessary to obtain the value at maturity.

Example: Adler Brothers receive from James A. Burkhart the note illustrated below. On April 14 they discount the note at 6% at the First National Bank. What are the proceeds received by Adler Brothers on April 14?



$450 00 Dover, Ohio March 25, 19

Sixty days after date I promise to pay to the order of Adler Bros.

Four Hundred Fifty 00/100 Dollars

Payable at Fifth-Third National Bank

Value received

No. 12 James A. Burkhart

Solution

(1) Date of maturity; 60 da. after March 25 = May 24
(2) Value at maturity; same as the face amount = $450
(3) Term of discount; April 14 to May 24 = 40 da.
(4) Bank discount; int. on $450 for 40 da. @ 6% = $3
(5) Proceeds; $450 − $3 = $447 Ans.

Exercise 9. (*Written*)

1. Find the proceeds for each of the following non-interest-bearing notes.

	FACE	DATE	TIME	DISCOUNT DATE	DISCOUNT RATE
a.	$800	Mar. 29	90 da.	June 2	6%
b.	450	July 18	60 da.	Aug. 12	6%
c.	975	May 25	45 da.	May 27	6%
d.	680	Sept. 21	80 da.	Sept. 21	6%
e.	750	Apr. 8	90 da.	Apr. 8	6%
f.	970	Oct. 10	2 mo.	Nov. 15	6%
g.	685	Feb. 28	4 mo.	Apr. 6	6%
h.	590	Aug. 2	3 mo.	Aug. 10	6%
i.	870	July 2	2 mo.	July 2	6%
j.	740	Aug.15	3 mo.	Aug. 15	6%

2. On September 15, James Ward's bank account was overdrawn by $275.70. On that date he discounted at 6% the following notes: a 60-day non-interest-bearing note for $325.50, dated August 22, and a 90-day interest-bearing note for $242.60, dated August 16. (a) Find the proceeds of each note. (b) What was Ward's bank balance after the proceeds were credited to his account?

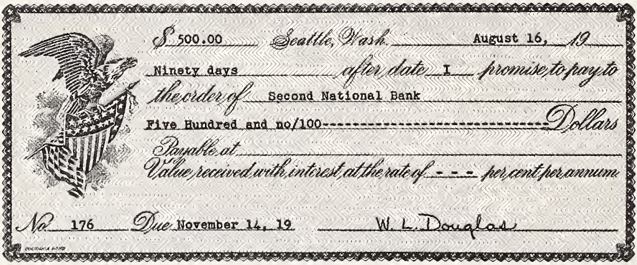
3. On June 11, Mr. Flatt received notice from his bank that his account was overdrawn $14.38 and that his 90-day note for $370, with interest at 4%, was due. (a) How much did Mr. Flatt owe the bank? (b) On June 11, Mr. Flatt went to his bank and discounted at 6% a customer's 2-month note for $500, dated June 3. What were the proceeds? (c) If the proceeds were deposited in his account, what was his new bank balance?

A note is assumed to be non-interest-bearing if the problem does not state specifically that it is an interest-bearing note.

4. On May 11, Hare & Company had a checkbook balance of $335.19. They wished to pay Crane & Company for goods purchased May 1 for $1,250, less 20% and 10%, terms 2/10, n/30. To raise additional funds for the bank account, they discounted G. Good's two-month, non-interest-bearing note for $600, dated April 15. They then mailed their check to Crane & Company. (a) For how much did Hare & Company write their check in payment of the bill? (b) What was the balance in the checkbook after the check was issued?

Discounting One's Own Non-Interest-Bearing Note. If a merchant is in need of additional cash but does not have any customers' notes to discount, he may discount his own non-interest-bearing note and obtain the proceeds. In such cases, the date of discount is usually the same as the date of the note. Calculation of the proceeds is performed in the same manner as the calculation of the proceeds of a customer's non-interest-bearing note.

Example: On August 16, W. L. Douglas, a shoe dealer. presents to the Second National Bank the note illustrated below. The bank discounts the note at 6%. Find the proceeds.



$ 500.00 Seattle, Wash. August 16, 19

Ninety days after date I promise to pay to the order of Second National Bank

Five Hundred and no/100---------------------------------- Dollars

Payable at

Value received with interest at the rate of - - - per cent per annum

No. 176 Due November 14, 19 W. L. Douglas

Solution

(1) *Date of maturity; 90 da. after August 16 = Nov. 14*
(2) *Value at maturity; same as face amount = $500*
(3) *Term of discount; Aug. 16 to Nov. 14 = 90 da.*
(4) *Bank discount; int. on $500 for 90 da. @ 6% = $7.50*
(5) *Proceeds; $500 — $7.50 = $492.50 Ans.*

Exercise 10. (*Written*)

1. On July 8, Ward & Chase discounted at 6% at the State National Bank their 80-day, non-interest-bearing note for $1,450, dated July 8. Find the proceeds credited to their account.

2. On February 2, the First Trust Company discounted A. J. Fuller's note for $875, dated February 2, payable in three months, without interest. What were the proceeds credited to Fuller's account if the discount rate was 5%?

3. On May 12, E. R. Lane received notice from his bank that his account was overdrawn $86.19. On that date he discounted at 5% his 75-day, non-interest-bearing note for $450. What was his bank balance after the proceeds were credited to his account?

4. Find the proceeds of each of the following non-interest-bearing notes discounted on the same day as the date of the note.

	Face	Date of Note	Time	Discount Rate
a.	$1,650	April 2	80 da.	6%
b.	1,380	March 19	120 da.	$5\frac{1}{2}$%
c.	1,275	Sept. 15	4 mo.	5%
d.	1,150	Jan. 10	3 mo.	7%

Problems for Application and Review

Group A

1. (a) Express 1.375 as a per cent. (b) Find $3\frac{3}{4}$% of $1,800. (c) $24.42 is 165% of what amount? (d) Express $10\frac{1}{2}$ mills as a decimal part of $1. (e) Express 16% as a common fraction.

2. Find the proceeds of a 60-day note for $475 dated May 6, with interest at 6%, and discounted on June 1 at 6%.

3. A profit of 60% on the cost is equivalent to what rate of profit on the selling price?

4. If a retailer pays $8.40 for an article, what must be his marked price of the article if he desires a gross profit of 25% on the selling price after allowing an advertised discount of $12\frac{1}{2}$% on the marked price?

5. A dealer bought a dozen suits of the same quality for $445, less 20% and 10%. At what price must he sell each suit in order to gain 25% on the selling price?

6. On December 22 you bought a bill of goods amounting to $867.75, terms 2/30, n/60. How much would be gained or lost by borrowing money at 6% so as to take advantage of the discount?

Group B

1. (a) Multiply $16\frac{5}{6}$ by $24\frac{3}{4}$. (b) Divide $18\frac{3}{4}$ by $22\frac{1}{2}$. (c) What per cent is equivalent to 2.5? (d) What amount is 55% greater than $26? (e) Express 1.6% as a common fraction.

2. Find the proceeds of a 6-month note for $2,000 dated January 18, with interest at 6%, and discounted June 15 at 6%.

3. Find the proceeds of a 90-day non-interest-bearing note for $2,500, dated May 17, and discounted June 20 at 6%.

4. On a 6% note for $1,200, dated May 16, a payment of $500 was made on December 7 of the same year. How much was due on February 15 of the next year, the date of final settlement, under (a) the United States Rule and (b) the Merchants' Rule?

5. At what price must I mark goods costing $2.70 so that I may allow a discount of 10% and still gain 60% on the cost?

Cumulative Review

1. On December 31, Field's bank statement showed a balance of $975.35. There were outstanding checks of $124.65 and $37.20. The bank had collected a $75 note for him, but he had not entered this item in his checkbook. His checkbook balance was $738.50. Prepare a reconciliation statement.

2. The regular factory hours of the Eastern Machine Company provide for 7 hours a day from Monday to Friday, inclusive, with time and a half for overtime. During the week of January 13, William Randall, a machinist, was employed as follows: Monday, 8 hours; Tuesday, 7 hours; Wednesday, $5\frac{1}{2}$ hours; Thursday, $8\frac{1}{2}$ hours; Friday, $7\frac{1}{2}$ hours. If Randall's regular wage rate was $2.10 an hour, what was the amount of his earnings for the week?

3. The following table shows the quotas, sales, and salaries of Williams and Oliver for December:

	QUOTA	SALES	SALARY
Williams	$2,500	$2,850	$250
Oliver	$3,000	$3,750	$300

In addition to his salary, each salesman received a bonus of 2% of sales up to and including his quota and a 4% bonus on sales in excess of his quota. (a) What was the total amount of Williams' bonus for December? (b) What were Oliver's total earnings during December?

4. Caleb Niles is about to put his house and lot up for sale through a real estate agent who charges 4% commission. If he wishes to realize a net proceeds of $12,000 after allowing the buyer a price concession of $400 and after paying the agent's commission, what should be his asking price for the property?

5. An antique lamp purchased several years ago for $8 is now valued at $40. What is the per cent of increase in the value of the lamp?

6. Find (a) the amount due at maturity and (b) the due date of a 45-day, $4\frac{1}{4}$% note for $445, dated December 10.

7. Ross Turner held a 5% mortgage for \$2,500 on the house and lot of C. M. Smith. The mortgage was dated March 1, 1953, with the interest payable semiannually. The following payments were recorded on it:

September 1, 1953; interest due and \$500 on the principal
March 1, 1954; interest due and \$500 on the principal

(a) If no additional payments were made, what amount was required to pay the mortgage in full on September 1, 1954? (b) What was the total amount of interest paid for the use of the money?

8. Smith wishes to purchase a TV set that sells for \$378 cash. However, if he buys it on the installment plan, the dealer wants a down payment of \$150 and the remainder in 12 equal monthly installments of \$21.32 each. According to either plan, the dealer will allow Smith \$100 for his used set to be applied on the down payment. (a) How much money will be paid if the set is bought for cash? (b) What will be the total amount of cash paid if the set is bought on the installment plan? (c) By what per cent will the amount of cash paid on the installment plan exceed the amount of cash paid on the cash plan?

9. Acme 5% bonds with a par value of \$100 may be purchased at 120. How much money must we invest in the bonds to yield an annual income of \$500?

10. What per cent on the investment, computed to the nearest tenth per cent, will a $4\frac{1}{2}$% stock pay if it is bought for 88, brokerage at the rate of \$34.80 per 100 shares?

11. Sawyer owned 200 shares of Central Oil stock. He authorized his broker to sell the stock at $69\frac{1}{8}$ and purchase Pacific Electric \$1,000 bonds at 125. The brokerage and taxes on the sale of the stock amounted to \$86.10, and the brokerage for buying the bonds was \$2.50 per bond. (a) What were the proceeds from the sale of the stock? (b) How many bonds were purchased? (c) What was the unexpended balance?

12. What monthly rental must be charged for a house costing \$9,500 to realize a net income of 6% on the investment if the annual expenses amount to \$450?

13. Foster purchased a house for \$13,900, paying \$5,500 in cash and giving a 5% mortgage for the balance. He rented the house for \$115 a month. If the annual expenses for taxes, insurance, repairs, and depreciation amounted to \$600, what rate of return, to the nearest tenth per cent, did Foster realize on his investment?

14. The building owned and occupied by the Ames Sales Company is valued at \$21,000 and the stock of goods at \$16,500. (a) What amount of insurance must be carried on each if they are insured for 80% of their value? (b) What will be the average yearly cost for insurance if the rate on the building is 95¢ per \$100 for a three-year policy and if the annual rate on the stock is 45¢ per \$100?

15. A building valued at \$28,000 was insured for \$20,000 under an 80% coinsurance-clause policy. A fire caused a loss of \$6,300. What amount was the insurance company required to pay the policyholder?

16. The reading of the electric meter at the residence of James Monroe is as follows:

May 1	6,150 kilowatt-hours
June 1	6,198 kilowatt-hours

Find the amount of Monroe's electric bill for the month if the service charge is \$.75 and the rate is 5 cents a K.W.H. for the first 30 K.W.H. and 3 cents a K.W.H. for all remaining kilowatt-hours.

17. The taxable property in a village is assessed at \$17,263,000. The total amount necessary to meet the expenses of the village government for the coming year is \$524,600. It is estimated that \$2,500 will be received from special licenses and \$75,300 will be received from the state for school purposes. (a) Find the tax rate. Carry the decimal to five places. (b) Express the rate as a tax per \$1,000. (c) What tax should Mr. Robinson pay if his property is valued at \$7,500 and is assessed at 80% of its value?

18. If \$236.34 represents the amount of an invoice less 2½% discount, what is the amount of the invoice?

19. For the year 1953 the sales of a firm were as follows: eggs, \$8,200; meat, \$7,400. For the succeeding year the sales were: eggs, \$6,100; meat, \$7,810. Find to the nearest tenth per cent the increase or decrease in the sales of each commodity.

20. A dining-room set was marked to sell at a gain of 60% on the cost. It was sold for \$350, which was a gain of 40% on the cost. What rate of discount on the marked price did the buyer receive?

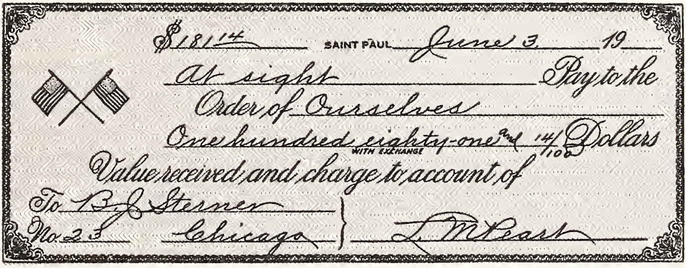
21. G. M. Brooks, a dealer in radios, purchased 20 radios at list price, less 33⅓% and 10%, and sold them at the same list price, less 10%. What was his gross profit on each radio if the list price was \$40?

Section 4 . . . Drafts and Trade Acceptances

Commercial Drafts. A draft is a written order by which a creditor directs his debtor to pay the amount of his indebtedness to the creditor or to a third party. When the creditor and debtor are business concerns or individuals, the draft drawn by the creditor is called a *commercial draft.*

Sight Drafts. A *sight draft* is a commercial draft that is payable at sight; that is, it is payable when it is presented to the debtor for payment.

Sight drafts are frequently used in collecting overdue invoices. When ordinary requests for payment fail, the creditor may draw a sight draft on the debtor, ordering him to pay the overdue amount. Illustrated below is the sight draft drawn by L. M. Peart, a creditor in Saint Paul, upon B. J. Sterner, his debtor in Chicago, to collect payment of an overdue invoice amounting to $181.14.

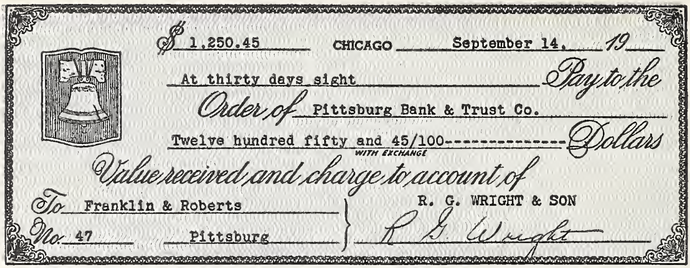


$181 14 SAINT PAUL June 3 19
At sight Pay to the
Order of Ourselves
One hundred eighty-one and 14/100 Dollars
WITH EXCHANGE
Value received and charge to account of
To B. J. Sterner
No. 23 Chicago
L. M. Peart

Sight Draft

To make collection, Peart gives the draft to his bank, which forwards it to a bank in Sterner's city, Chicago. This second bank presents the draft to Sterner for payment. If Sterner pays the draft, the Chicago bank remits the cash to Peart's bank, which in turn credits Peart's account for the amount collected.

Time Drafts. Instead of requiring the debtor to make immediate payment, a creditor may be willing to allow the debtor a certain period of time before payment must be made. In this case, the draft may be drawn so that it is payable a certain number of days after sight, as shown in the illustration on page 408.



$ 1,250.45 CHICAGO September 14, 19

At thirty days sight Pay to the

Order of Pittsburg Bank & Trust Co.

Twelve hundred fifty and 45/100 Dollars

WITH EXCHANGE

Value received and charge to account of

To Franklin & Roberts

No. 47 Pittsburg

R. G. WRIGHT & SON

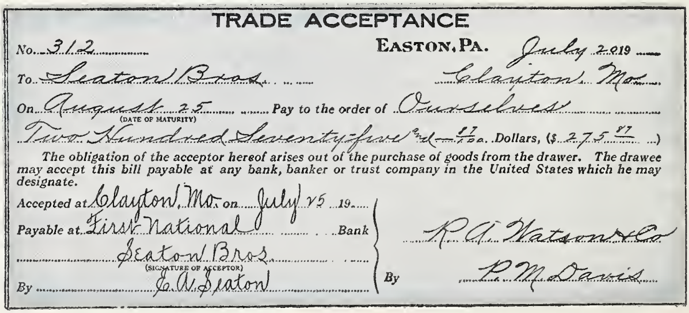
R G Wright

Time Draft Payable After Sight

The draft shown above is payable "At thirty days sight," which means that the draft is payable thirty days after the day on which it is presented to and accepted by the debtor. This draft is known as a *time draft*. A time draft may also be made payable a specified time after date. The debtor accepts the draft by writing "Accepted" across the face of the draft, together with the date of acceptance and his signature. The accepted draft is then returned to the creditor.

After acceptance, a time draft is to all intents and purposes the same as a promissory note. The debtor, by accepting the draft, assumes an obligation similar to that of the maker of a note.

Trade Acceptances. Another type of draft used by business concerns is the *trade acceptance*. This is a time draft drawn in settlement of a sale of merchandise at the time the sale is made. A typical trade acceptance is shown below.



TRADE ACCEPTANCE

No. 312 EASTON, PA. July 20 19

To Seaton Bros. Clayton, Mo.

On August 25 (DATE OF MATURITY) Pay to the order of Ourselves

Two Hundred Seventy-five and 87/100 Dollars, ($275 87/100)

The obligation of the acceptor hereof arises out of the purchase of goods from the drawer. The drawee may accept this bill payable at any bank, banker or trust company in the United States which he may designate.

Accepted at Clayton, Mo. on July 25 19

Payable at First National Bank

Seaton Bros (SIGNATURE OF ACCEPTOR)

By E. A. Seaton

R. A. Watson & Co

By P. M. Davis

Trade Acceptance

The trade acceptance differs from an ordinary time draft in that the former is drawn at the time the goods are sold to the customer, whereas the latter is drawn to collect an overdue invoice. A trade acceptance, when accepted, is to all intents and purposes the same as a promissory note.

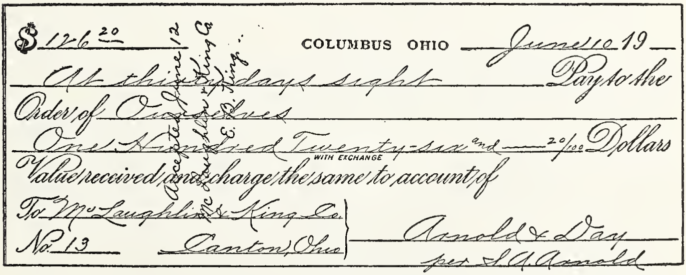
Discounting Time Drafts and Trade Acceptances. Accepted time drafts and trade acceptances may be discounted at the bank in the same manner as promissory notes. Drafts and trade acceptances do not bear interest. Hence, the proceeds of a time draft or a trade acceptance are found in the same manner as the proceeds of a non-interest-bearing note.

Thus, if the trade acceptance shown on page 408 is discounted at 6% by R. A. Watson & Company on July 26 at the First National Bank, the calculation of the proceeds would be:

Date of maturity = Aug. 25
Value at maturity; same as face amount = \$275.87
Term of discount; July 26 to August 25 = 30 days
Bank discount; int. on \$275.87 for 30 da. @ 6% = \$1.38
Proceeds; \$275.87 − \$1.38 = \$274.49

Exercise 11. (*Written*)

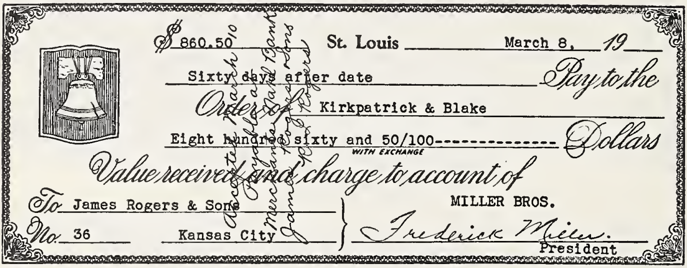
1. On June 15 Arnold & Day receive the following accepted draft from McLaughlin & King Company. This is a time draft due "At thirty days sight," and the maturity date of this type of draft is computed from the date of acceptance. If Arnold & Day discount the draft at their bank on June 16 at 6%, what are the proceeds?



\$126 20/100 COLUMBUS OHIO June 10 19
At thirty days sight Pay to the
Order of Ourselves
One Hundred Twenty-six and 20/100 Dollars
WITH EXCHANGE
Value received and charge the same to account of
To McLaughlin & King Co.
No. 13 Canton, Ohio
Arnold & Day
per S. A. Arnold

Accepted June 12
McLaughlin & King Co.
E. King

2. On March 21 Kirkpatrick & Blake discount the following accepted draft at the Merchants National Bank at 5½%. This time draft is due a specified number of days after date, and the maturity date on this type of draft is computed from the date on which it is drawn. What are the proceeds received by Kirkpatrick & Blake?



$ 860.50 St. Louis March 8, 19

Sixty days after date Pay to the Order of Kirkpatrick & Blake

Eight hundred sixty and 50/100-------------- Dollars

WITH EXCHANGE

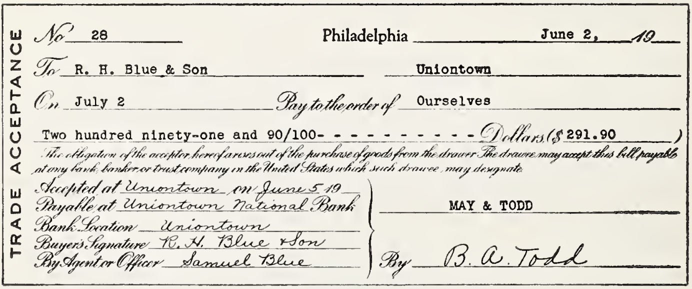
Value received and charge to account of

To James Rogers & Sons
No. 36 Kansas City

MILLER BROS.
Frederick Miller.
President

Accepted March 10
Payable at
Merchants Natl Bank
James Rogers & Sons
Rogers

3. The following trade acceptance was drawn on R. H. Blue & Son by May & Todd. If May & Todd discount the acceptance on June 7 at the Ashland State Bank at 6%, what are the proceeds?



TRADE ACCEPTANCE

No. 28 Philadelphia June 2, 19

To R. H. Blue & Son Uniontown

On July 2 Pay to the order of Ourselves

Two hundred ninety-one and 90/100- - - - - - - - - - Dollars ($ 291.90)

The obligation of the acceptor hereof arises out of the purchase of goods from the drawer. The drawee may accept this bill payable at any bank, banker or trust company in the United States which such drawee may designate.

Accepted at Uniontown on June 5 19
Payable at Uniontown National Bank
Bank Location Uniontown
Buyer's Signature R. H. Blue & Son
By Agent or Officer Samuel Blue

MAY & TODD
By B. A. Todd

4. Listed below are a number of time drafts discounted at the Parker National Bank. Find the proceeds of each draft.

	Face	Date of Draft	Time	Date of Acceptance	Discount Date	Discount Rate
a.	$742.29	July 3	30 days after date	July 6	July 19	5%
b.	629.01	Aug. 30	60 days sight	Sept. 3	Sept. 6	7%
c.	248.76	April 7	3 mo. after date	April 8	April 10	6%
d.	479.28	Feb. 14	90 days sight	Feb. 18	Feb. 23	5%
e.	373.48	Dec. 18	30 days sight	Dec. 20	Dec. 22	7%

Problems for Application and Review

Group A

1. (a) Find the sum of $9\frac{5}{12}$, $15\frac{1}{5}$, and $11\frac{3}{8}$. (b) Express $.18\frac{1}{3}$ as a common fraction. (c) $29.25 is 130% of what amount? (d) What per cent is equivalent to $\frac{5}{200}$?

2. Find the proceeds of a time draft for $745, dated May 10, due 90 days after date, accepted on May 15, and discounted on July 2 at 6%.

3. Find the proceeds of a 3-month non-interest-bearing note for $1,250, dated November 8, and discounted on January 11.

4. What is the highest price a clothier should pay for raincoats that retail at $16.95 if he desires a gross profit of 50% on the cost?

5. A profit of 60% on the selling price is equivalent to what rate of profit on the cost?

6. A fruit dealer bought 10 boxes of oranges, 150 to the box, at $6.75 a box. He estimates that 4% of the fruit will spoil. At what price per dozen must he sell the remainder in order to gain $33\frac{1}{3}$% on the cost of the 10 boxes?

Group B

1. (a) Subtract $16\frac{2}{3}$ from $25\frac{3}{8}$. (b) Express 1.4 as a per cent. (c) What amount decreased by 15% of itself gives $21.25. (d) What per cent is equal to $\frac{3}{400}$?

2. Find the proceeds of a time draft for $680, dated March 8, drawn at 90 days sight, accepted on March 12, and discounted on April 28 at 6%.

3. A 45-day note of J. R. Howe for $4,176.25, with interest at 6%, dated May 29, is discounted on June 17. Find the proceeds.

4. A dealer marks goods at $62\frac{1}{2}$% above the gross cost. Find his marked price of an article costing $36 on which he had to pay $2 for freight charges.

5. A dealer estimates that his selling and overhead expenses amount to 20% of his total sales. If he buys a radio for $64, less 25% and 10%, at what price must he sell it in order to gain $12\frac{1}{2}$% on the selling price?

6. A vegetable dealer bought 5 crates of lettuce at $6.20 a crate. If each crate contained 60 heads and spoilage averaged 10%, at what price did he have to sell each of the salable heads in order to make a profit of 30% on the cost of the whole order?

Section 5 . . . Interest on Account Balances

Interest on Overdue Invoices. Some wholesalers and manufacturers charge interest on invoices that are not paid at maturity. This is done both to stimulate customers to pay within the regular credit period and to offset the interest loss that results when invoices are not paid promptly.

When a customer pays an overdue invoice on which there is an interest charge, interest is calculated on the invoice for the number of days from the date of maturity to the date of payment. If the customer has made one or more partial payments on the invoice, the net amount due on a particular date is calculated by adding to the total amount of the invoice, interest on the full invoice from maturity to the date of final payment, and deducting from that sum the total amount of the payments plus interest on each payment to the date of final settlement.

Example: On March 5, James Helborn buys $764 worth of goods from the Barkley Hardware Company; terms, 60 days. Mr. Helborn pays $264 on April 29 and $250 on May 14. What payment must he make on June 3 to cover the remaining amount due, including interest at 6% from maturity date?

Solution

March 5 + 60 da. = May 4, due date of invoice

Invoice		*$764.00*
Add: Int. from May 4 to June 3 (30 da.)		*3.82*
		$767.82
Payments		
April 29, $264.00, + int. to June 3, 35 da.,	*$1.54*	
May 14, $250.00, + int. to June 3, 20 da.,	*.83*	
$514.00 +	*$2.37 =*	*516.37*
Balance Due, June 3		*$251.45*

Interest on Account Balances. Some customers make frequent purchases and thus may have a series of overdue invoices. In this case, the amount required to pay the balance of the customer's account is calculated by finding the total of the invoices plus the interest on each invoice from maturity to the date of final settlement. From this total is deducted the sum of the payments and interest on each payment from the date of payment to the date of final settlement.

For example, shown below is the account with C. H. Middleton as it appears on the books of the Davis Company. The entries in the "Debit" column show the amounts of the invoices for merchandise sold to Mr. Middleton; those in the "Credit" column show the amounts of his cash payments.

NAME *C. H. Middleton*

ADDRESS *3109 Ashland Avenue*

DATE		EXPLANATION	DEBIT		CREDIT		BALANCE	
19—								
Mar.	*1*	*30 days*	*287*	*60*			*287*	*60*
	10	*60 days*	*194*	*85*			*482*	*45*
Apr.	*1*				*200*	—	*282*	*45*
	7	*60 days*	*513*	*38*			*795*	*83*
June	*1*				*100*	—	*695*	*83*

If the Davis Company charges 6% interest on overdue invoices, the payment required to settle the account on September 1 would be $707.75, computed as follows:

INVOICES

MATURITY	AMOUNT	DAYS TO SEPT. 1	INTEREST	
March 31	$287.60	154	$7.38	
May 9	194.85	115	3.73	
June 6	513.38	87	7.44	
	$995.83	+	$18.55 =	$1,014.38

PAYMENTS

DATE	AMOUNT	DAYS TO SEPT. 1	INTEREST	
April 1	$200.00	153	$5.10	
June 1	100.00	92	1.53	
	$300.00	+	$6.63 =	306.63
Payment Required, September 1				$ 707.75

Exercise 12. (Written)

1. On June 6, John Dillard purchases a washing machine, priced at $68.50, from the Blakely Hardware Company; terms, 30 days. He makes payments of \$20 on June 20 and \$10 on July 10. If the company charges 6% interest on overdue accounts, how much must he pay on August 5, the date of final settlement?

2. On January 15, the Miller Specialty Company sells to John Due merchandise listed at \$215.50, less 10% and 5%; terms, 30 days. The company charges 5% interest on overdue accounts. If Mr. Due pays \$50 on February 14, how much does he owe on March 1, the date of final settlement?

3. On March 2 and April 15, the Mason Specialty Company makes sales to Roy Ames of \$156.80 and \$205.45, respectively; terms, 30 days. The company charges 6% interest on overdue accounts. Ames makes a payment of \$150 on April 1. If on June 30 he pays the amount due, what is the amount of his payment?

4. The bookkeeping records of Roe Bros. show the following sales on account to A. L. Fuller: March 20, \$208.12, terms 60 days; April 10, \$186.16, terms 30 days; May 12, \$321.90, terms 60 days. The records also show the following payments received from Fuller on account: June 1, \$100; July 1, \$200; August 1, \$100. On October 1, Mr. Fuller wishes to give Roe Bros. a note for the amount due on account. Roe Bros. charge 6% interest on overdue accounts. What is the face of the note?

Problems for Application and Review

1. (a) $55\frac{5}{6}$ is what part greater than $33\frac{1}{2}$? (b) What amount increased by $\frac{3}{8}$ of itself equals \$5.28? (c) Find $\frac{2}{5}$% of \$825. (d) \$7.56 is 5% more than what amount?

2. On April 10, May 25, and June 17, the Barclay Supply Company makes sales to J. C. Barton of \$327.50, \$500.35, and \$181.25, respectively; terms, 30 days. The company charges 6% interest on overdue accounts. Barton makes a payment of \$150 on May 1 and \$200 on June 1. If on August 1 he pays the remaining amount due, what is the amount of his payment?

3. Find the proceeds of a 90-day non-interest-bearing note for \$2,400, dated November 17, and discounted on January 18.

4. On a 6% demand note for \$1,450, dated September 7, a payment of \$600 was made on November 30 of the same year. What amount was necessary to make final settlement on January 15 of the next year under (a) the United States Rule and (b) the Merchants' Rule?

5. A retailer bought boys' sweaters at \$36 a dozen, less 20% and 10%. At what price must he sell each sweater to gain 40% on the selling price?

Section 6 . . . Bankruptcy of a Customer

Insolvency and Bankruptcy. Occasionally a debtor concern finds itself unable to pay its debts as they fall due. In this condition the concern is said to be *insolvent.* The creditors or the concern itself may request a court to declare the concern *bankrupt.* This the court may do by ordering the concern's property to be administered for the benefit of the creditors. A *trustee,* or *receiver,* is then elected by the creditors or appointed by the court to convert the concern's property into cash and distribute it to the creditors.

Settlement in Bankruptcy. The cash received by the trustee from the sale of the concern's property is applied first to pay the cost of the bankruptcy proceedings and certain claims that have priority. The amount remaining is then divided among the creditors in proportion to their claims. The per cent to be paid each creditor is determined by dividing the total cash available by the total of the claims.

Example: E. J. Lee, a retail grocer, failed in business with liabilities to creditors amounting to $10,000. The assets of the business were sold for $5,200, cash, and the cost of the bankruptcy proceedings was $450. (a) What per cent of the creditors' claims can the trustee pay? (b) How much will the Central Wholesale Company receive from the trustee in settlement of its claim of $800?

Solution

(a) *Cash assets*	*$5,200*	
Bankruptcy expenses	*450*	
Available for creditors	*$4,750*	

$$\frac{\$4{,}750}{\$10{,}000} = .475 = 47.5\% \quad \textit{Ans.}$$

(b) *$800 × .475 = $380. Ans.*

In the foregoing example, each creditor receives 47.5% of his claim. It may therefore be said that he receives 47.5 cents on the dollar.

Exercise 13. (*Written*)

1. W. C. Case fails in business with assets of $9,000 and liabilities of $24,000. The assets are sold for $4,200, and the cost of the bankruptcy proceedings amounts to $600. (a) What per cent of the creditor's claims can be paid? (b) How much should G. R. Day & Company, a creditor, receive if the firm's claim against Case is $1,200?

2. The property of P. J. Engel, a bankrupt, was sold for $4,600, and the cost of the bankruptcy proceedings totaled $475. (a) If the bankrupt's debts amounted to $13,200, how much should Stolow Brothers receive in settlement of a claim of $152.80 against him? (b) How much is received per dollar?

3. A bankrupt's assets are $9,108.85, and his liabilities are $14,850. The cost of the bankruptcy proceedings is $718.60. (a) How much will M. C. Thomas receive if the bankrupt owes him $63.40? (b) How much will be paid per dollar?

Assume that the $9,108.85 represents the cash value, or liquidated value, of the assets.

4. E. B. Tucker, a bankrupt, has assets of $9,370.15 and liabilities of $23,421.20. (a) Find the per cent, correct to three decimal places, to be used as the basis for settlement with creditors. (b) How much will a creditor receive if his claim amounts to $420.75?

Assume that the $9,370.15 represents the final cash assets available for distribution to the creditors.

5. On June 15, the Strand Flower Shop purchases from the Stanley Nursery flowers invoiced at $322.24; terms, 2/10, n/30. On June 30, the Strand Flower Shop makes a payment of $50. On July 12, the shop goes into bankruptcy. If the creditors are paid 32.3 cents on the dollar, what amount will be received by the Stanley Nursery?

Problems for Application and Review

Group A

1. (a) What number divided by $8\frac{1}{3}$ equals $6\frac{3}{4}$? (b) $13\frac{1}{3}$ is what part smaller than 20? (c) What per cent equals $\frac{100}{125}$? (d) Express $\frac{3}{8}\%$ as a decimal. (e) What per cent of $37\frac{1}{2}$ is 60?

2. A bankrupt owes you a bill of $240. If his total liabilities are $10,807 and his total assets are $2,162, how much should you receive on settlement?

Express the relationship of the assets to the liabilities in the form of a common fraction. Then multiply that fraction by the amount of the claim.

3. A clothier buys neckties at $15 per dozen. At what price must he mark each tie in order that he may allow a discount of

$12\frac{1}{2}\%$ during a special sale and still realize a profit of 40% on the cost?

4. A profit of $66\frac{2}{3}\%$ on the cost is equivalent to what rate of profit on the selling price?

5. A dealer purchased a living room set for $173.25. At what price must he mark the set to make a profit of 30% on the selling price after allowing an advertised discount of 10% on the marked price?

Group B

1. (a) Multiply $41\frac{3}{4}$ by $10\frac{1}{5}$. (b) $3.30 is $\frac{2}{3}$ of what amount? (c) What per cent is equivalent to 4? (d) $2.25 increased by what per cent of itself gives $9? (e) Find $\frac{3}{10}\%$ of $2,460.

2. Jones, a bankrupt, has assets of $198.25 with liabilities of $13,215. How much will a creditor receive if his claim amounts to $365?

3. Rogers gave you a 90-day note for $615, dated December 24, with interest. You discounted the note on January 20 at the bank at 6%. How much did you receive for the note?

4. A profit of $37\frac{1}{2}\%$ on the selling price is equivalent to what rate of profit on the cost?

5. On November 10, a dealer purchased goods amounting to $1,600, less 10% and 10%, terms 2/10, n/30. (a) How much did he save by paying the invoice on November 20? (b) What was the amount of the check he drew on November 20 to pay the invoice?

Group C

1. (a) Divide $16\frac{1}{2}$ by $3\frac{2}{3}$. (b) What amount decreased by $\frac{3}{8}$ of itself equals $4.80? (c) Express $.12\frac{1}{2}$ as a common fraction. (d) Multiply $24,400 by .0145.

2. Ladies' hats costing $2.40 were sold for $6. If hats of the same grade cost $3.20 today, at what price should they be sold to make the same rate of profit on the selling price?

3. At what price should a dealer mark an article in order that he may receive $76.50 for it after allowing an advertised discount of 15% on the marked price?

4. On an invoice of goods amounting to $2,176.50 you are offered either 90 days credit or a 5% discount for cash. How much would you save by borrowing the money at 6% and paying the bill in cash?

5. Find the single discount equivalent to a series of discounts of 20%, $12\frac{1}{2}\%$, and 5%.

Section 7 . . . Problems of the Commission Merchant

Function of the Commission Merchant. Many manufacturers, farmers, and other producers who are distantly located from the wholesale marketing centers often find it advantageous to sell their products through *commission merchants* located in the central markets. When this is done, the producer, who is referred to as the *principal,* ships goods to the commission merchant *on consignment.* The commission merchant receives the goods, sells them for the best prices he can obtain, pays all the necessary expenses, deducts his commission, and remits the balance to the principal. In this way the producer is relieved of the burden of finding for himself a market for his products.

Some commission merchants act as buyers for manufacturers and wholesalers who wish to purchase materials or merchandise but who do not have the time or facilities for keeping informed as to the available sources of supply. Upon receiving a purchase order from his client, or principal, the commission merchant, who is in touch with the various sources of supply, purchases the goods as specified and ships them to the principal. He then bills the principal for the cost of the goods, his commission, and any other expense he incurs in making the purchase.

There are other merchants, called *brokers,* who handle no merchandise, but simply negotiate sales or purchases of goods that are in the hands of producers or wholesalers or in a central warehouse. For arranging the sale of the merchandise, the broker receives a commission. The broker's rate of commission is usually smaller than that received by a commission merchant.

To Find the Net Proceeds of a Sale of Goods by a Commission Merchant. When a commission merchant sells goods for a principal, the total amount the commission merchant obtains for the goods is called the *gross proceeds.* The amount to be remitted to the principal is called the *net proceeds.* The net proceeds are found by subtracting the commission merchant's expenses and commission from the gross proceeds.

Gross Proceeds − Expenses and Commission = Net Proceeds

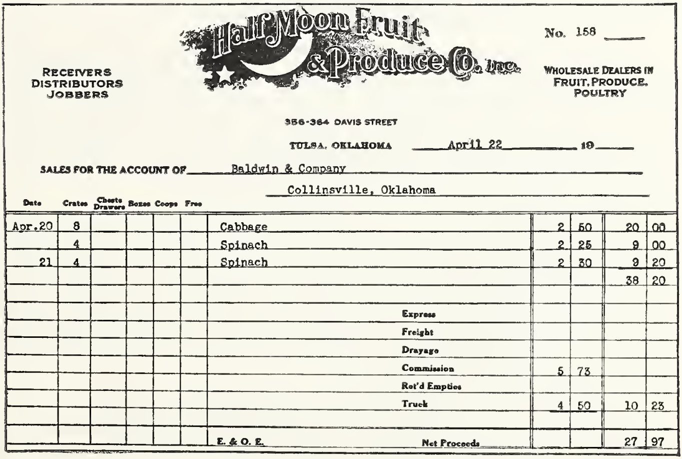
The merchant's rate of commission on a sale of goods is usually expressed as a per cent of the gross proceeds, although sometimes it is a specified amount for each unit of goods sold.

Example: The Half Moon Fruit & Produce Company received from Lester Baldwin a consignment of 8 crates of cabbage and 8 crates of spinach. The company sold 8 crates of cabbage @ $2.50, 4 crates of spinach @ $2.25, and 4 crates of spinach @ $2.30. If the company paid $4.50 for trucking expenses and charges 15% commission, what are the net proceeds the company should remit to Mr. Baldwin?

Solution

Gross proceeds:		
8 crates @ $2.50		*$20.00*
4 crates @ 2.25		*9.00*
4 crates @ 2.30		*9.20*
		$38.20
Charges:		
Trucking	*$4.50*	
Commission, *15% of $38.20*	*5.73*	*10.23*
Net proceeds		*$27.97*

As soon as he sells the merchandise, the commission merchant remits to his principal the amount of the net proceeds together with a report of the sale. This report, called an *account sales*, lists the gross proceeds received from the sale, the various expenses incurred by the merchant in handling the merchandise, the commission, and the net proceeds remitted to the principal. The account sales that the Half Moon Fruit & Produce Company submitted to Lester Baldwin is shown below.



Half Moon Fruit & Produce Co. Inc.

No. 158

RECEIVERS
DISTRIBUTORS
JOBBERS

WHOLESALE DEALERS IN
FRUIT, PRODUCE,
POULTRY

356-364 DAVIS STREET

TULSA, OKLAHOMA April 22 19

SALES FOR THE ACCOUNT OF Baldwin & Company
Collinsville, Oklahoma

Date	Crates	Chests Drawers	Boxes	Coops	Free					
Apr.20	8					Cabbage	2	50	20	00
	4					Spinach	2	25	9	00
21	4					Spinach	2	30	9	20
									38	20
						Express				
						Freight				
						Drayage				
						Commission	5	73		
						Ret'd Empties				
						Truck	4	50	10	23
						E. & O. E. Net Proceeds			27	97

Account Sales

Exercise 14. (*Written*)

1. H. H. Dix ships to a commission merchant three dressed veals weighing 160 lb., 185 lb., and 210 lb. How much should Dix receive if the commission merchant sells the veals for 52 cents per pound and deducts 10% commission and $4.10 express charges?

2. (a) When beets are sold at $.90 a tub, which is better for the commission merchant, a commission of 3% or a commission of 3¢ a tub? (b) When celery is sold for $3.80 a crate, which is better for the commission merchant, a commission of 5% or a commission of 15 cents a crate?

3. An apple grower shipped to a commission merchant in Chicago 6 carloads of apples of 1,500 boxes each, to be sold on commission. The agent paid freight at 35 cents per box and total storage $65. He then sold the apples at $2.00 per box, charging 5% commission. Find the net proceeds.

4. A farmer shipped to a New York commission merchant to be sold on commission 3 carloads of potatoes containing respectively 35,600 lb., 36,200 lb., and 34, 800 lb. The agent paid freight at the rate of 55 cents per hundred pounds. Before the potatoes could be sold, the agent had to put them into bags, each containing 100 pounds, for which service he charged $132.50. The agent then sold the potatoes for $6.75 a bag, charging 5% commission. Find the net proceeds to be remitted to the farmer.

5. W. E. Miller bought 370 boxes of apples at $1.95 per box and shipped them to a Philadelphia commission merchant. The commission merchant paid the freight, which was $56.80. The apples were sold for $987.60. After deducting 5% commission and the freight charges, the commission merchant remitted the proceeds to Miller. What was Miller's profit?

To Find the Gross Cost of a Purchase by a Commission Merchant. When a commission merchant buys goods for a principal, the amount that the merchant pays for the goods is called the *prime cost*. The *gross cost* of the goods to the principal is the prime cost plus the merchant's expenses connected with the purchase and the merchant's commission.

Prime Cost + Expenses and Commission = Gross Cost

The merchant's rate of commission on a purchase of goods is usually expressed as a per cent of the prime cost.

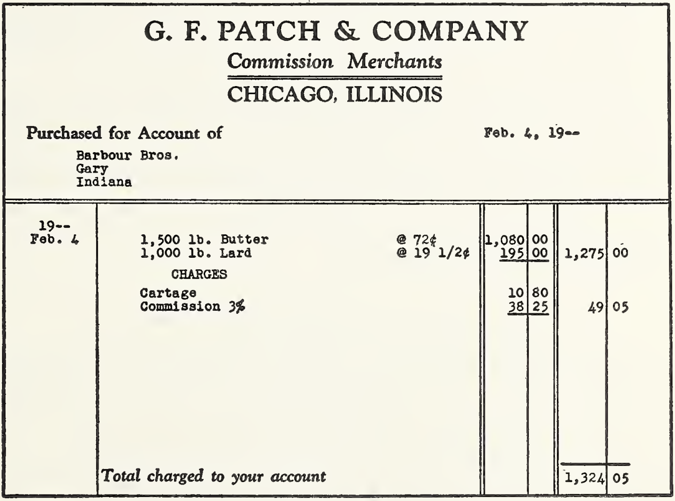
Example: Barbour Bros. ordered G. F. Patch & Co. to purchase 1,500 lb. butter at 72¢ per lb., and 1,000 lb. lard at 19½¢ per lb. The company made the purchase, paid $10.80 for cartage charges, and charged 3% commission. Find the gross cost to Barbour Bros.

Solution

Prime cost:		
1,500 lb. @ 72¢		*$1,080.00*
1,000 lb. @ 19½¢		*195.00*
		$1,275.00
Charges:		
Cartage	*$10.80*	
Commission, 3% of $1,275	*38.25*	*49.05*
Gross cost		*$1,324.05*

Upon executing the order from the principal, the commission merchant sends to the principal a report showing all the details of the transaction. This report, called an *account purchase,* lists the prime cost of each item of merchandise purchased, the charges paid by the merchant in handling the merchandise, the commission, and the total amount charged to the principal.

The account purchase that G. F. Patch & Company sent to Barbour Bros. is shown below.



G. F. PATCH & COMPANY
Commission Merchants
CHICAGO, ILLINOIS

Purchased for Account of Feb. 4, 19--

Barbour Bros.
Gary
Indiana

19-- Feb. 4	1,500 lb. Butter	@ 72¢	1,080 00	
	1,000 lb. Lard	@ 19 1/2¢	195 00	1,275 00
	CHARGES			
	Cartage		10 80	
	Commission 3%		38 25	49 05
	Total charged to your account			1,324 05

Account Purchase

Exercise 15. (*Written*)

1. William Erbe, Inc., a canning company, purchased through a commission merchant 42,350 pounds of beans at $12.10 per cwt. The broker charged 2% commission, and the freight charges were 37½¢ per hundred pounds. What was the gross cost of the beans to the canning company?

2. Mr. R. W. King, a miller, purchased through a commission merchant 2,000 bushels of wheat at $2.50 per bushel. If the broker charged 2% commission and freight charges were 18¢ per hundred pounds, what was the gross cost of the wheat? (Wheat: 60 pounds to a bushel.)

3. R. G. Rice, a commission merchant, bought for cash the following consignment of cheese for the Local Stores Company: 120 boxes, averaging 60 pounds to the box, at 56½¢ a pound, and 100 boxes, averaging 60 pounds to the box, at 58¢ a pound. Rice paid the cartage amounting to $27.50 and also prepaid the freight amounting to $79.78. (a) How much money did Rice advance on the entire transaction? (b) If Rice charged 3% commission on the purchase, how much did the cheese cost the Local Stores Company?

4. A wholesale dealer directed his agent to purchase 5,000 pounds of coffee at 54¢ a pound. The agent paid $32.80 for freight and cartage, and $13.20 for storage. He charged 2% commission for buying. For how much a pound must the wholesale dealer sell the coffee to make a profit of 25% on the gross cost?

5. A commission merchant purchased for Walker & Son a carload of potatoes, containing 40,200 pounds, at $4.45 a bag. The net weight of each bag was 100 pounds. The commission merchant's expenses and charges were $111.40 for freight, $37.75 for sacks, $49.50 for labor, and 5% commission. (a) How much did the potatoes cost Walker & Son? (b) What price per bushel (60 pounds) did Walker & Son pay?

Problems for Application and Review

1. (a) Divide 497 by 350,000. (b) What per cent is equivalent to 5? (c) What number multiplied by $5\frac{1}{3}$ gives 120? (d) $\frac{28}{200}$ equals what per cent? (e) Express 8.2 mills as a decimal part of $1.

2. A poultry farmer sent 25 cases of eggs (30 dozen to the case) to a commission merchant. The commission merchant sold the eggs at 64¢ a dozen. His charges were: truck expense, $27.50; commission, 4%; other expenses, $7.80. How much should the commission merchant remit to the poultry farmer?

3. The property of a certain bankrupt was sold for $9,533.96. If the bankrupt's debts were $18,264.10, how much should you receive in settlement of a claim of $521.76 against him?

4. On January 10, Peter Downes gave you his 90-day non-interest-bearing note for $57.75. How much did the bank give you for it if you discounted it on January 20 at 6%?

5. On a 6% note for $1,250, dated March 11, 1954, the following payments were made: June 19, $300; September 2, $150; November 1, $475. What amount was due on January 21, 1955, the date of final settlement, under (a) the United States Rule and (b) the Merchants' Rule?

6. Men's suits that cost $24 were sold for $32. If suits of the same grade cost $30 today, at what price should they be sold to make the same rate of profit on the selling price?

Cumulative Review

1. Hildreth's bank statement, on December 1, showed a balance of $387.29. His checkbook balance on the same date was $214.86. A deduction slip included with the cancelled checks showed that Hildreth's account had been charged $18.75 for a U. S. Savings bond purchased for him by the bank. Checks outstanding were for $100.00; $84.12; $7.06. Prepare a reconciliation statement.

2. The employees of the Bedell Foundry Company are paid weekly on the basis of a 40-hour week with time and a half for overtime. During the month of November, George Mann worked 44 hours the first week, 36 hours the second week, 48 hours the third week, and 40 hours the fourth week. His regular rate of pay is $1.67 cents an hour. Find Mann's total wages for the four weeks.

3. Miss Kent, a hosiery saleswoman, is paid a salary of $30 per week and 8% commission on all sales in excess of a weekly quota of $200. Last week her total sales amounted to $312. What were Miss Kent's total earnings for that week?

4. A salesman receives a salary of $250 a month and a commission of 5% on all sales in excess of $6,000 in any single month. What must be the amount of his sales each month in order that his total monthly income may be $475?

5. If the interest on a loan of $400 for 90 days is $3.50, what is the rate of interest?

6. A finance company offered to lend Benson $300, to be repaid at $50 a month plus interest at 2% a month on the unpaid balance. He decided to borrow the $300 from a bank where he could repay it in 6 monthly payments of $51.50 each, including interest. (a) How much interest did he pay the bank? (b) How much interest would he have paid the finance company? (c) How much did he save?

7. A savings bank pays interest on its deposits at the rate of 2½% a year and adds interest to the balance on the first of January, April, July, and October. On April 1, 1953, Seth Thomas deposited $800. On July 1 he withdrew $200, and on October 1 he deposited $400. (a) How much did he have on deposit on January 1, 1954? (b) What was his total interest for the nine months?

8. Over a period of 5 years, Thompson buys a U. S. Savings Bond on the first of each month, paying $18.75 per bond. At the end of 9 years 8 months from the date of purchase, each bond will be worth one-third more than its cost. What total sum of money will Thompson receive for these bonds if he keeps them all until their redemption dates?

9. On February 28, John Ryder purchased 40 shares of Excelsior stock of no-par-value at 29⅞ a share, for which the broker charged $14.38 commission for buying and a tax charge of $2.40. Ryder held the stock until the following May 1, when he sold the stock for 35⅜ a share and paid a commission of $15.37 for selling and taxes amounting to $4.03. During the time that Ryder held the stock, he received a dividend of 50 cents a share. (a) For how much did the broker bill Ryder when the stock was purchased? (b) How much did Ryder receive from the broker who sold the stock? (c) What was Ryder's net gain or loss on the entire transaction?

10. A piece of real estate, consisting of land and buildings worth $15,000, was mortgaged for $8,000, assessed for $10,000, and insured for the value of the buildings, $12,000. Find the annual expense if the interest rate on the mortgage is 5%, the tax rate is $54 per $1,000, the insurance rate for three years is $5 per $1,000, depreciation is 2% of the value of the buildings, and repairs and upkeep require 1% of the full value of the property.

11. The total annual rental of a piece of business property is $6,600. The annual expenses are $3,725. Assuming that the rent and expenses will remain the same, what is the highest price a buyer should pay for the property if he desires a net return of 5% on his investment?

12. A businessman is paying $4,800 a year rent for the first floor of a store building. He can buy the building for $60,000. He would then receive a total of $4,000 annually in rent from the other two floors and he would have the following expenses: taxes, $950;

insurance, $240; repairs and depreciation, $1,100; janitor service, $1,200. If money is worth 6% to him in his business, how much would he gain or lose by purchasing the building?

13. Andrews insured his house, valued at $24,000, for $16,000 under a policy which contained an 80% co-insurance clause. A fire loss of $8,400 occurred. What amount of money would Andrews collect from the insurance company?

14. Butler insured his house for $10,000 with the Superior Insurance Company, and for $4,000 with the Peerless Insurance Company. If a fire loss of $3,500 occurred, what amount of money would Butler receive from the Superior Company?

15. The budget for next year for the village of Preston requires $87,500 to meet all expenses. Fines, licenses, and other revenue will supply $4,051.19. The taxable property in the village has a total assessed valuation of $2,156,300. What is the tax rate per $1,000 which must be levied on property in Preston next year?

16. Wood is employed on a 40-hour-per-week basis, with time and a half for all overtime. His regular pay rate is $1.60 per hour. During a recent week he worked 50 hours. Total deductions from his pay amounted to $17.87. What amount of money did Wood receive as "take-home" pay for the week, after all deductions had been made?

17. When Edmonds prepared his state income tax return for last year, he figured that the amount of his net taxable income, after all deductions had been made, was $4,942 for the year. This amount was subject to a tax of 2% on the first $1,000, 3% on the next $2,000, and 4% on the next $2,000 or any part thereof. What was the total of his state income tax?

18. The records of C. A. Bradley, a dry goods dealer, show the following for last year: merchandise inventory January 1, $9,150; merchandise inventory December 31, $7,675; sales, $56,442; purchases, $31,195; operating expenses, $14,423. Find (a) the cost of goods sold for the year and (b) the net profit.

19. The price of an adding machine to schools is $275, less 10% and 10%. How much would a school have to pay for one machine?

20. A catalog lists a feed mixer at $150. The same mixer is billed to a dealer at $97.50. What rate of discount is allowed?

21. If a merchant saved $19.50 by taking a cash discount of 2%, what was the invoice price of the merchandise he purchased?

22. The cash discount at 3% on an invoice of goods is $40.50. What is the net cost?

23. On October 15 the Mohawk Produce Company bought 3,600 bushels of potatoes at $3.45 a bushel and put them in storage. Three months later the company sold the potatoes for $4.02 a bushel and had to pay 6¢ a bushel for storage and a total charge of $273.60 for sorting, carting, and insuring. In sorting the potatoes it was found that there was a loss of 180 bushels due to decay. How much did the company gain on the transaction?

24. A dealer bought men's suits for $40, less 35%. When the dealer's selling price was $38.50, the sales averaged 14 suits a day. When the selling price was reduced to $36.50, the sales increased so that they averaged 20 suits a day. What was the per cent increase or decrease in daily profit?

25. An ice refrigerator is billed to a dealer at $75, less 20% and 10%. He allows his salesman a commission of 8% on sales and figures his overhead expenses at 12% of sales. At what price should he sell the refrigerator to gain 20% of the selling price?

26. A druggist has been buying a certain face powder at 50¢ a box. In order to increase sales, the wholesaler offered a special advertising discount of 10% and 5% if the druggist would buy one carton (36 boxes) of face powder a month for four months. The druggist accepted the offer and planned for a special sale. At what price per box could the druggist advertise the face powder in order to make $33\frac{1}{3}$% on the cost?

27. A fruit dealer buys 10 crates of strawberries (32 baskets to the crate) at $9.45 per crate, delivered. He estimates that 20 baskets will spoil and will have to be thrown away. At what price per basket must he sell the remainder in order to gain a profit of $33\frac{1}{3}$% on the cost of the 10 crates?

28. A clothing retailer bought 100 suits at $30 each and marked each suit to sell at a profit of 50% on the cost. Near the end of the season he has 15 suits left. To what price may he reduce each of the 15 suits and still make a profit of 45% on the cost of the 100 suits?

29. Williams had 860 bushels of potatoes to sell. He could have sold them with no expense involved at $2.10 a bushel. However, he sent them to a commission merchant, who sold 450 bushels at $2.60 and the remainder at $2.25 a bushel. The commission merchant charged 3¢ a bushel for storage, $36.80 for freight and cartage, and a 3% commission. (a) Find the amount of the net proceeds remitted to Williams. (b) How much did Williams gain or lose by sending his potatoes to the commission merchant rather than selling them locally?

UNIT XII

PROBLEMS OF THE MANUFACTURER

Section 1 . . . Manufacturing Costs

Elements of Factory Cost. A manufacturing business makes the articles that it sells. In order that the selling price of the finished articles may be quoted so as to yield a profit, the manufacturer must keep a record of his manufacturing costs. These costs are divided into three classes as follows:

(1) **Raw Materials.** Under this heading a record is kept of the cost of materials that are used in manufacturing and which become a part of the finished product.

(2) **Direct Labor.** Under this heading is recorded the cost of the wages of all machine operators, mechanics, or other workmen who work directly upon the articles as they pass through the factory.

(3) **Factory Expense, or Factory Overhead.** Under this heading a record is kept of the cost of the salaries or wages of the factory superintendent, department foremen, inspectors, and others whose work is necessary for the operation of the factory but who do not work directly on the manufactured product. Other expenses of a similar nature recorded under this heading include rent of the factory building, depreciation of machinery and equipment, heat, light, power, insurance, etc. Also included under this heading are the costs of the factory supplies, such as the grease and oil for operating the factory machinery.

The sum of the costs of the raw materials, direct labor, and factory expenses gives the total cost of manufacturing, or the total *factory cost.* These items are often referred to as the *elements of factory cost.*

Exercise 1. (*Written*)

1. The factory cost records of the Milton Shoe Company show the following costs for the shoes manufactured during the year ending last December 31:

Raw materials cost $55,872.80. Direct labor totaled $73,309.20.

Factory overhead consisted of: salaries and wages, $7,200; rent and royalties, $3,260; depreciation and repairs, $4,150; power, heat, and light, $1,141.65; factory supplies, $2,638.25; miscellaneous factory expense, $818.75.

(a) What was the total factory overhead for the year? (b) What was the total factory cost?

2. The records of the Rollins Manufacturing Company show the following manufacturing costs for the goods manufactured during the first quarter of the year: raw materials, $62,520; direct labor, $81,895; factory expense, $37,110. What was the total factory cost of the goods produced during the quarter?

3. In producing 50 dozen sweaters, the Cohoes Knitting Mills incurred the following manufacturing expenses: material, $624.75; labor, $798.75; factory expense, $449.20. What was the average factory cost of each sweater, computed to the nearest cent?

4. In filling an order for 1,500 radio receiving sets at $24.50 each, the Emery Electric Company incurred the following factory costs: material, $8,895.75; labor, $12,862.50; factory overhead, $4,158.20. What was the company's gross profit on the order?

Depreciation. One of the important items of factory expense is the depreciation of the machinery and equipment. As explained on page 260, under the straight-line method of computing depreciation, the annual rate of depreciation is obtained by dividing the estimated average annual depreciation by the original cost.

Example: If the estimated life of a machine costing $1,000 is four years, at the end of which time it can be sold as scrap for $100, what per cent of the original cost should be included each year in the record of factory expense?

Solution

$1,000 original cost
− 100 scrap value
$ 900 total depreciation

$900 ÷ 4 = $225, average annual depreciation
$225 ÷ $1,000 = 22½%. Ans.

Exercise 2. (Written)

1. Drilling machinery costing $1,250 is estimated to have a service life of 5 years, at the end of which time it will have a resale value of $250. (a) What is the estimated annual depreciation? (b) What is the annual rate of depreciation?

2. Find the yearly depreciation and the yearly rate of depreciation for each of the following:

Property	Original Cost	Scrap or Resale Value	Estimated Life	Yearly Depreciation	Rate of Depreciation
a. Power Drills	$1,500	$ 60	15 yrs.	?	?
b. Lathes	800	80	12 yrs.	?	?
c. Motors	2,000	100	10 yrs.	?	?
d. Tools	500	50	6 yrs.	?	?
e. Planing Machines	2,500	225	7 yrs.	?	?
f. Conveyors	4,000	260	11 yrs.	?	?

3. The annual depreciation of the wood-turning machinery in the factory of the Tracy Millwork Corporation is estimated at 8% of the original cost. (a) What amount should be included in the yearly factory expense record for depreciation of wood-turning machinery that cost $3,600? (b) What amount should be included each month if the factory expense record is kept on a monthly basis?

4. A hoisting machine costing $1,500 decreases in value each year at the rate of 9% on the original cost. Find the estimated value of the hoist at the end of the fourth year.

5. The Madison Machine Tool Company purchases a milling machine for $4,750 and estimates the annual depreciation at 6% of the original cost. (a) What is the amount of the annual depreciation expense for the machine? (b) If the service life of the machine is estimated at 13 years, how much does the company expect the machine will be worth at the end of that time?

Apportionment of Factory Expenses. In order for the manufacturer to know the manufacturing costs by each department, it is necessary to apportion the factory expense, or overhead, among the various departments. The method of apportionment varies with the nature of the expense.

The cost of rent, for example, is usually distributed in proportion to the floor space occupied by the departments.

Example: The factory of the Henshaw Manufacturing Company pays rent amounting to \$6,000. Find the amount that should be apportioned to each of its 3 departments if Department A occupies 1,000 sq. ft. of floor space; Department B, 2,500 sq. ft.; and Department C, 1,500 sq. ft.

Solution

$$1{,}000 + 2{,}500 + 1{,}500 = 5{,}000 \text{ sq. ft., total floor space}$$

$$\text{Department A } \frac{1{,}000}{5{,}000} \text{ or } \tfrac{1}{5} \text{ of } \$6{,}000 = \$1{,}200$$

$$\text{Department B } \frac{2{,}500}{5{,}000} \text{ or } \tfrac{1}{2} \text{ of } \$6{,}000 = \$3{,}000$$

$$\text{Department C } \frac{1{,}500}{5{,}000} \text{ or } \tfrac{3}{10} \text{ of } 6{,}000 = \frac{\$1{,}800}{\$6{,}000}$$

Taxes and insurance charges on the machinery and equipment are distributed on the basis of the value of these items in the various departments. The cost of the power for operating the machinery is apportioned on the basis of the horsepower of the various machine motors and the number of hours they are in operation. Other items of expense are apportioned in various ways, depending upon the preference of the particular factory.

Exercise 3. (*Written*)

1. The four factory departments of the Bryant Manufacturing Company occupy floor space as follows: machine shop, 2,000 sq. ft.; carpenter shop, 1,500 sq. ft.; assembly room, 1,800 sq. ft.; finishing room, 1,200 sq. ft. The annual rental cost of the factory building is \$2,600. What amount should be charged to each department annually if this expense is distributed on the basis of the floor space that each department occupies?

2. The Worthington Company pays its factory superintendent \$13,500 a year. This expense is distributed to the factory departments on the basis of the number of employees in each department. Find the amount that should be charged to each department if the number of employees is as follows: Department A, 24; Department B, 72; Department C, 56; Department D, 8.

3. Operation of the Webster Manufacturing Company requires electric power costing $1,500. This expense is apportioned among the departments on the basis of horsepower-hours, which are obtained by multiplying the horsepower of each factory motor by the number of hours the motor is in operation. Find the amount to be charged to each department if the horsepower-hours of Department A are 18,000; of Department B, 28,800; and of Department C, 43,200.

4. The yearly insurance on the machinery and equipment of the Fruitvale Manufacturing Company amounts to $440. The valuation of the machinery and equipment in each department is as follows: Department A, $15,500; Department B, $6,200; Department C, $12,400. What amount of insurance should be charged to each department if this expense is distributed in proportion to the value of the machinery and equipment?

Problems for Application and Review

Group A

1. (a) Subtract $24\frac{7}{8}$ from $34\frac{2}{3}$. (b) Express $\frac{1}{8}$ of 1% as a decimal. (c) Find $112\frac{1}{2}\%$ of $5.12. (d) What amount is $112\frac{1}{2}\%$ greater than $3.04? (e) $24 is $\frac{3}{8}\%$ of what amount?

2. Machinery costing $3,000 was estimated to have a life of 10 years, at the end of which time it could be sold for $250. (a) What was the estimated annual depreciation? (b) What was the annual rate of depreciation, computed to the nearest tenth per cent?

3. An agent received a carload of potatoes containing 37,200 pounds. He paid $118.85 for freight, $35.74 for sacks, and $43.50 for labor. (a) If the agent sold the potatoes for $4.35 a bag, each bag containing 100 pounds, and charged 5% commission, how much should he remit to the owner? (b) How much a bushel (60 pounds) did the owner receive for his potatoes?

4. How much will the bank pay me June 19 if I discount Curran's three-month note for $1,575.16, dated April 19, with interest at 6%?

5. A bankrupt's assets total $1,800 and his liabilities total $12,000. How much will a creditor receive whose claim is $900?

Group B

1. (a) Multiply 860 by 1,300. (b) Express 2.4% as a common fraction. (c) $36 is $\frac{3}{4}\%$ of what amount? (d) What amount minus 15% of itself leaves $74.80? (e) Divide 483 by 420,000.

2. Equipment that cost $12,000 was valued at the end of 5 years at $2,000. (a) What was the amount of the average annual depreciation? (b) What was the annual rate of depreciation?

3. The four departments of a certain factory occupy floor space as follows: Department A, 5,400 sq. ft.; Department B, 6,000 sq. ft.; Department C, 3,000 sq. ft.; Department D, 3,600 sq. ft. The annual rental cost of the factory building is $5,400. What amount should be charged to each department if this expense is distributed on the basis of the floor space that each department occupies?

4. Wilson, a commission merchant, received from Powers 1,500 bushels of potatoes. He sold 635 bushels at $2.80, 475 bushels at $2.76, and the remainder at $2.70 a bushel. He remitted the net proceeds to Powers after deducting his commission of 5%, freight charges of $169.50, sorting and weighing expense of $76.50, and storage charges of 5¢ a bushel. What was the amount of the net proceeds remitted?

5. A chair that cost $13.50 has been selling for $18.90. If the same type of chair costs $16.75 today, at what price should it be sold to make the same rate of profit on its cost?

Group C

1. (a) Multiply $16\frac{2}{3}$ by $5\frac{1}{3}$. (b) $12\frac{5}{6}$ is what part greater than $9\frac{1}{3}$? (c) $1.80 is $\frac{2}{3}$% of what amount? (d) $2.40 is $66\frac{2}{3}$% more than what amount? (e) Express $.18\frac{3}{4}$ as a common fraction.

2. The monthly rent of a department store is $5,600. It is desired to distribute this expense over four departments on the basis of the floor space that each department occupies, as follows: dry goods, 3,750 sq. ft.; groceries, 1,250 sq. ft.; wearing apparel, 3,000 sq. ft.; house furnishings, 2,000 sq. ft. Ascertain the amount of rent chargeable to each department.

3. A fruit dealer bought 8 crates of strawberries, each crate containing 24 quarts, at $6.75 a crate. If spoilage is estimated at $16\frac{2}{3}$%, at what price per quart must he sell the remainder to gain 25% on the selling price of the 8 crates?

4. A four-month non-interest-bearing note for $1,224.60, dated November 12, was discounted at the bank on January 15. Find the proceeds.

5. A florist bought 50 dozen roses at $3 a dozen. He estimates that 20% will become wilted and unsalable. At what price per dozen must he sell the remainder to gain 60% on the cost of the entire lot?

Section 2 . . . Statements of a Manufacturer

Profit and Loss Statement. The profit and loss statement of a manufacturer is similar to the profit and loss statement of a mercantile business. A typical statement of a manufacturer, with the percentage analysis, is shown below.

SANFORD MANUFACTURING COMPANY
PROFIT AND LOSS STATEMENT
FOR THE YEAR ENDING DECEMBER 31, 19—

Net Sales		$150,000	100%
Cost of Goods Sold:			
Finished Goods Inventory, January 1, 19—	$ 15,000		
Cost of Finished Goods Manufactured	85,000		
Finished Goods Available for Sale	$100,000		
Finished Goods Inventory, December 31, 19—	10,000		
Cost of Goods Sold		90,000	60%
Gross Profit on Sales		$60,000	40%
Selling and General Administrative Expenses:			
Salesmen's Salaries	$13,000		
Advertising Expense	6,000		
Officers' Salaries	12,000		
Office Salaries	9,000		
Miscellaneous Expense	5,000		
Total Selling and General Administrative Expenses		45,000	30%
Net Profit		$15,000	10%

By comparing the foregoing statement with the one for a mercantile business shown on page 305, you will observe that the principle difference is in the terms used in the cost of goods sold section. In the statement of the manufacturer, the expression "Finished Goods Inventory" is used in place of "Merchandise Inventory," and the expression "Cost of Finished Goods Manufactured" is used in place of "Purchases."

Exercise 4. (*Written*)

1. On January 1, the inventory of finished hosiery on hand in the stock room of the Franklin Hosiery Company was $15,000. During the year, additional hosiery costing $300,000 was manufactured and placed in stock. At the end of the year, December 31, the inventory of finished hosiery on hand in the stock room was $20,000. (a) What was the cost of the hosiery sold during the year? (b) If the company's net sales for the year were $393,000, what was the amount of the company's gross profit?

2. On April 1, the finished goods inventory of the Bell Electric Manufacturing Company was $25,500. The factory cost of additional finished goods manufactured during the next three months was $189,600. The net sales for the period amounted to $271,600. On June 30, the finished goods inventory was $21,800. (a) What was the cost of goods sold during the period? (b) What was the company's gross profit for the period? (c) What was the company's net profit if the selling and general administrative expenses amounted to $47,900?

3. The accounting records of the Crown Milling Company show the following information for the quarter ending September 30: net sales, $215,000; finished goods inventory July 1, $18,600; cost of finished goods manufactured, $174,100; finished goods inventory September 30, $16,400; selling and general administrative expenses, $30,100. Find (a) the cost of goods sold, (b) the gross profit, and (c) the net profit for the period.

4. In Problem 3, above, what per cent of the net sales is (a) the cost of goods sold, (b) the selling and general administrative expenses, and (c) the net profit? Prove your results by adding the three per cents. The sum should be 100%.

Exercise 5. (*Written*)

1. In filling an order for 5,000 pairs of shoes at $8 a pair, the manufacturing costs of the Milton Manufacturing Company were distributed as follows: material, $11,176.60; labor, $14,661.80; factory overhead, $3,841.70. (a) What was the total factory cost? (b) What was the company's gross profit on the order? (c) If the company estimates the selling and administrative expenses at 18% of net sales, what was the company's net profit on the order?

2. Frank Williams, a manufacturer of women's dresses, incurred the following costs in completing an order for 200 dresses at $4.50 each: materials, $422.25; labor, $128.64; overhead, 20% of the combined cost of materials and labor. (a) What was the total factory cost? (b) What was the firm's gross profit on the order? (c) If the firm estimates the selling and administrative expenses at 15% of net sales, what was the firm's net profit on the order?

3. In producing an order for 100 men's suits, the manufacturer's costs were as follows: material, \$1,012.16; labor, \$1,052.64; factory expense, \$367.20. (a) If the suits were sold at \$40 less 20% and 5%, and the selling and general expense is figured at $12\frac{1}{2}$% of net sales, what is the manufacturer's net profit on the order? (b) What per cent of the sales price is the net profit?

4. The cost of making a kitchen cabinet is as follows: material, \$9.24; labor, \$6.96; factory overhead, \$4.80. The selling and administrative expense amounts to 20% of the selling price. (a) How much net profit does the manufacturer realize on the sale of each cabinet if his selling price is \$30? (b) What is the rate of net profit, based on the selling price?

5. The cost of manufacturing a vacuum cleaner is as follows: material, \$14.10; labor, \$10.55; overhead, \$2.85. What rate of net profit, computed to the nearest per cent, does the manufacturer realize on the selling price if the selling and general management expense amounts to 28% of the selling price and the cleaner is sold at \$60, less $16\frac{2}{3}$% and 10%?

Statement of Cost of Goods Manufactured. When the profit and loss statement is prepared, there is also prepared a statement of cost of goods manufactured to show in detail the cost of the goods manufactured during the period. Shown on the next page is the statement of cost of goods manufactured prepared by the Sanford Manufacturing Company.

The cost of the raw materials used in the manufacturing process is found by adding to the beginning inventory the cost of purchases, after adding freight in, and subtracting the ending inventory.

The sum of the cost of raw materials placed in process, of direct labor, and of the manufacturing expenses gives the total cost of goods placed in process. Goods in process are raw materials undergoing changes in the factory process in order to produce finished goods. Their value is increased by the labor directly performed on the goods and by the manufacturing expense apportioned to the goods.

SANFORD MANUFACTURING COMPANY

Statement of Cost of Goods Manufactured

For the Year Ending December 31, 19—

Raw Materials			
Inventory, January 1		$28,000	
Purchases	$34,000		
Less Pur. Ret. and Allow.	550		
Net Purchases	$33,450		
Add Freight In	2,800		
Cost of Purchases		36,250	
Total Cost of Raw Materials Available for Use		$64,250	
Less Inventory, December 31		27,000	
Cost of Raw Materials Placed in Process			$37,250
Direct Labor			25,550
Manufacturing Expenses			
Factory Rent		$ 2,950	
Indirect Labor		11,900	
Property Taxes		1,150	
Depreciation on Equipment		2,400	
Insurance on Equipment		680	
Heat, Light, and Power		1,020	
Maintenance and Repairs		640	
Factory Supplies		160	
General Factory Expense		300	
Total Manufacturing Expenses			21,200
Total Cost of Goods Placed in Process			$84,000
Add Goods in Process, January 1			15,500
Total Cost of Goods in Process During Year			$99,500
Less Goods in Process, December 31			14,500
Cost of Goods Manufactured			$85,000

To the total cost of goods placed in process is added the cost of goods in process on January 1. The resulting figure is the total cost of goods in process during the year. Subtraction of the goods in process on December 31 then gives the cost of finished goods manufactured during the year.

Exercise 6. (Written)

1. The Farmhand Manufacturing Company had a beginning inventory of raw materials of $225,480. Purchases of materials for the year were $958,482; purchases returns, $2\frac{1}{2}\%$ of purchases; and freight in, $36,480. The ending raw materials inventory amounted to $246,895. What was the cost of raw materials used in the manufacturing process?

2. The total cost of goods placed in process by the Peterson Manufacturing Company during July was $27,500. Goods in process July 1 were $4,500. Goods in process July 31 were $4,750. What was the cost of the goods manufactured?

3. Last year the Collins Manufacturing Company had a beginning inventory of raw materials of $8,729.65. Purchases of materials during the year amounted to $12,500. Freight on purchases was $1,162.41; purchases returns and allowances, $375.22. The ending raw materials inventory was $4,861.55. Direct labor during the year amounted to $8,123.40; manufacturing expense, to $3,641.82. The beginning inventory of goods in process was $5,492.87. The ending inventory was $6,155.20. Prepare a statement of cost of goods manufactured.

4. The Mather Sugar Refining Company had a January 1 raw materials inventory of $10,650. Purchases during the year were $67,485. The raw materials inventory on December 31 was $11,794. Direct labor for the year was $78,496. Manufacturing expenses were 70% of direct labor. Goods in process on January 1 amounted to $16,480; on December 31, to $14,879. What was the cost of goods manufactured for the year?

5. The cost of direct labor in the Wolfe Manufacturing Plant during November was $7,865.40. The cost of materials was 126% of the cost of direct labor. Manufacturing expenses were 65% of the combined cost of direct labor and materials. The beginning inventory of goods in process amounted to $5,067.45. The ending inventory was 20% larger. What was the cost of goods manufactured during the month?

Problems for Application and Review

Group A

1. (a) What number divided by $\frac{2}{3}$ gives 132? (b) $18\frac{3}{4}$ is what part smaller than 30? (c) What amount increased by $\frac{3}{5}$ of itself equals $79.20? (d) $\frac{7}{200}$ equals what per cent?

2. Machinery that cost $40,000 was valued at the end of 8 years at $1,600. (a) What was the average annual depreciation? (b) What was the annual rate of depreciation?

3. The annual heating expense of a certain factory is $1,500. It is desired to distribute this expense to the departments in proportion to the floor space occupied by each. The distribution of the floor space is as follows: Department A, 4,800 sq. ft.; Department B, 6,000 sq. ft.; Department C, 2,400 sq. ft.; Department D, 1,200 sq. ft. Find the amount of heating expense to be apportioned to each department.

4. A commission merchant sold 143,000 lb. of potatoes for a farmer. He sold 32,000 lb. at $3.50 per cwt., 39,000 lb. at $3.25 per cwt., and the balance at $3.00 per cwt. Selling commission was 5%, storage $122, trucking $187, and bagging expense 25¢ per cwt. (a) What was the average price per cwt. received by the commission merchant? (b) What was the amount remitted to the farmer?

5. On a 6% note for $2,400, dated October 13, 1953, the following payments were recorded: December 11, 1953, $850; March 18, 1954, $1,450. Find the amount due on August 15, 1954, the date of final settlement, under (a) the United States Rule and (b) the Merchants' Rule.

Group B

1. (a) Express .11$\frac{2}{3}$ as a common fraction. (b) What per cent is equivalent to 2$\frac{1}{2}$? (c) $70 increased by what per cent of itself gives $224? (d) $2.25 is $\frac{3}{5}$% of what amount?

2. In manufacturing 1,200 men's suits to be sold at $27.75 each, the costs were distributed as follows: material, $12,842.11; labor, $10,986.57; overhead, $2,811.32. (a) The gross profit was what per cent of the sales price? (b) What was the average manufacturing cost per suit?

3. A clothing merchant bought 48 suits at $30 each and marked them to sell at a profit of 40% on the cost. At the end of the season he had 8 suits left. To what price may he reduce each suit and still make a profit of 35% on the cost of the 48 suits?

4. The Hudson Company bought a quantity of furniture amounting to $2,840, subject to 25% trade discount and on terms 2/10, n/60. In order to take advantage of the cash discount, the company borrowed the money for 50 days at 6% and paid the bill. How much did the company gain by borrowing the money?

5. If discounted at 6% on June 14, what were the proceeds of a 2-month note for $6,725.50, dated June 1, with interest at 6%?

Section 3 . . Determining the Selling Price and the List Price

To Calculate the Manufacturer's Selling Price of an Article. The manufacturer's calculations in pricing a manufactured article are similar to those of the retailer in pricing merchandise purchased for resale.

Example: In the factory of Gates and Osborn, the manufacturing cost of a certain line of gloves is \$3.15 per pair. Selling and general administrative expenses average 20% of the firm's net sales. At what price should they sell the gloves if they wish to realize a net profit of 10% on the selling price?

Solution

The gross profit is 20% + 10%, or 30% of the selling price.

$$\begin{aligned} 100\% \text{ of Selling Price} &= \text{Selling Price}\\ -\ \underline{30\%} \text{ of Selling Price} &= \underline{\text{Gross Profit}}\\ 70\% \text{ of Selling Price} &= \text{Factory Cost} = \$3.15\\ \text{Selling Price} &= \$3.15 \div 70\%\\ &= \$3.15 \div .7 = \$4.50.\ \textit{Ans.} \end{aligned}$$

Proof: Selling Price − Gross Profit = Cost
\$4.50 − 30% of \$4.50 = \$4.50 − \$1.35 = \$3.15

Exercise 7. (Written)

1. The factory cost of a washing machine is \$87.50. The manufacturer's selling and general administrative expense averages 18% of the selling price. At what price should the manufacturer sell the machine to the dealer if the manufacturer desires a net profit of 12% on the selling price?

2. The manufacturing cost of a radio receiving set is as follows: material, \$6.27; labor, \$8.25; factory expense, \$1.98. Selling and general management expense averages 25% of sales. If the manufacturer wants to make a net profit of $12\frac{1}{2}\%$ on his sales, at what price should he sell each set?

3. The factory cost of a certain vacuum cleaner is \$27.50. The selling and general administrative expense per cleaner amounts to \$12.30. The manufacturer sells each cleaner so as to make a net profit of 10% on the selling price. (a) The total of the factory cost and the selling and general administrative expense is what per cent of the selling price? (b) What is the manufacturer's selling price of the cleaner?

4. In figuring the selling price of hats, the Stevens Hat Company uses the following manufacturing costs per hat: material, \$1.47; labor, \$1.89; factory overhead, \$.84. The company estimates the selling and management expenses at 26% of sales. At what price per dozen should the company sell the hats to dealers in order to make a net profit of 10% on the selling price?

5. The cost of manufacturing and selling a 6-piece set of aluminum cooking utensils is as follows: material, \$5.89; labor, \$2.55; factory expense, \$1.93; selling and general administrative expense, \$4.15. If the manufacturer desires to realize 12% net profit on sales, at what price must he sell each set?

6. The combined cost of manufacturing and selling a pair of slippers is \$3.57. At what price must the manufacturer sell each pair in order to make a net profit of 15% on the selling price?

To Calculate the Manufacturer's List Price of an Article, Given the Manufacturer's Selling Price and the Rate of Trade Discount. The price quoted by a manufacturer of an article is often in the form of a list price, or catalog price, less a specified trade discount or discount series. Before setting the list price of the article, the manufacturer first determines his selling price, or invoice price, in the manner explained on page 439. The list price is then set at such a figure that the amount remaining after deducting the trade discounts will equal the predetermined invoice price.

Example: A manufacturer of kitchen cabinets desires to receive \$23.40 for each set after allowing trade discounts of 25% and 20% from the list price. At what price should the manufacturer list the sets in his catalog?

Solution

$$\begin{aligned}
100\% \textit{ of List Price} &= \textit{List Price}\\
\underline{25\%} \textit{ of List Price} &= \underline{\textit{1st Discount}}\ (25\% \textit{ of } 100\%)\\
75\% \textit{ of List Price} &= \textit{1st Remainder}\\
\underline{15\%} \textit{ of List Price} &= \underline{\textit{2d Discount}}\ (20\% \textit{ of } 75\%)\\
60\% \textit{ of List Price} &= \textit{Invoice Price} = \$23.40\\
\textit{List Price} &= \$23.40 \div 60\%\\
&= \$23.40 \div .6 = \$39. \textit{ Ans.}
\end{aligned}$$

Proof: \$39 − 25% of \$39 = \$39 − \$9.75 = \$29.25, 1st remainder

\$29.25 − 20% of \$29.25 = \$29.25 − \$5.85 = \$23.40, invoice price

Exercise 8. (Written)

1. A manufacturer wishes to receive $2.75 for a certain style of vanity case after allowing the wholesaler a trade discount of 45%. What should be the manufacturer's catalog price of this vanity case?

2. At what price should the manufacturer list a desk lamp in his catalog if he desires to receive $5.94 for it after allowing the dealer a trade discount of 28%?

3. A manufacturer wishes to list an article so that the invoice price will be $3.15 after allowing discounts of 30% and 10%. What should the list price be?

4. Find the price at which each of the following articles should be listed in the catalog of the Templeton Furniture Company.

Article	Invoice Price	Trade Discount	List Price
a. Table	$26.95	30%	?
b. Chair	7.80	35%	?
c. Desk	14.40	20% and 20%	?
d. Bookcase	22.95	25% and 10%	?

To Find the Price at Which an Article Should Be Listed to Yield the Manufacturer a Given Rate of Profit After Allowing Trade Discount on the List Price. When the factory cost, rate of desired profit, and rate of trade discount are given, the computation of the list price is performed in two steps, as follows:

(1) Compute the invoice price by the method explained on page 429.

(2) Using the invoice price obtained in (1), above, compute the list price by the method explained on page 430.

Exercise 9. (Written)

1. At what price should a manufacturer list an article that costs him $15 to manufacture if he wishes to make a gross profit of 40% on the selling price after allowing a trade discount of 20% from the list price?

2. The factory cost of an article is $21.45, and the selling and general administrative expense averages 22% of sales. At what price should the manufacturer list the article in order to realize a net profit of 12% on the selling price after allowing the purchaser a trade discount of 16$\frac{2}{3}$%?

3. At what price should the manufacturer list an article that costs him $42 to manufacture if he wishes to realize a gross profit equal to 30% of the selling price after allowing the dealer a trade discount of 20%.

4. It costs a rug manufacturer $76.50 to make and sell a certain 9 x 12 rug. At what price should he list the rug in his catalog in order to make a net profit of 15% on the selling price after allowing a trade discount of 37½% on the catalog price?

5. An electric motor that costs $98 to manufacture is so listed in the catalog that the manufacturer realizes a gross profit of 30% on the selling price after trade discounts of 20% and 16⅔% are allowed. (a) What is the manufacturer's selling price of the motor? (b) What is his catalog price?

6. If it costs $17.82 to manufacture and sell an article and the manufacturer desires to make a net profit of 12% on the selling price after allowing trade discounts of 10% and 10%, at what price should the article be listed in the manufacturer's catalog?

To Find the Additional Trade Discount Necessary to Reduce the Invoice Price of an Article to a Lower Price Level. The manufacturer sometimes finds it necessary or desirable to lower his selling price, or invoice price, because of competition, lower production costs, or other reasons. This is accomplished by allowing another discount in addition to the present discounts. The additional discount is always based on the present invoice price.

Example: The Westlake Company manufactures ironing boards and sells them to dealers at $10, less 20% and 20%. To meet the prices of competitors, the company must reduce the invoice price to $5.60. (a) What additional trade discount, expressed as a per cent, must the company allow? (b) What will be the new discount series?

Solution

(*a*)

$10.00	*list price*	*$6.40*	*present invoice price*
2.00	*1st disc. (20% of $10)*	*5.60*	*new invoice price*
$ 8.00	*1st remainder*	*$ .80*	*additional discount*
1.60	*2d disc. (20% of $8)*	$\frac{\$\ .80}{\$6.40}=\frac{1}{8}=12\frac{1}{2}\%$. *Ans.*	
$ 6.40	*invoice price*		

(*b*) *20%, 20%, and 12½%. Ans.*

Exercise 10. (Written)

1. The Arctic Manufacturing Company has been selling "Arctic" refrigerators at $250, less 30%. To meet competition, the company decides to allow an additional discount so that the invoice price to the dealer may be $154. What additional discount, expressed as a per cent, must the company offer?

2. An article is listed in a manufacturer's catalog at $5.50, less 20%. Because of lower production costs, the manufacturer decides to reduce the invoice price to $3.85. What additional trade discount, expressed as a per cent, should be allowed?

3. An article is listed at $64, less 25% and $16\frac{2}{3}$%. The market price of the article drops to $27. What additional discount, expressed as a per cent, must be offered to meet this price?

4. In each of the following, find the additional discount, expressed as a per cent, that must be offered, and the new discount series.

	List Price	Present Discounts	New Selling Price	Additional Discount	New Discount Series
a.	$24	40%	$9.60	?	?
b.	$45	$33\frac{1}{3}$%	$25.50	?	?
c.	$20	40% & 20%	$8.00	?	?
d.	$75	$33\frac{1}{3}$% & 20%	$38.00	?	?

Problems for Application and Review

Group A

1. (a) Multiply 220 by 320,000. (b) Subtract $13\frac{3}{4}$ from $32\frac{1}{6}$. (c) $15\frac{1}{8}$ is what part greater than $8\frac{1}{4}$? (d) $33.60 is $\frac{3}{8}$ less than what amount? (e) Express .025 as a common fraction.

2. The manufacturing cost of a certain radio is $42.50. At what price should the manufacturer sell the radio if a profit of 32% of the selling price is desired?

3. Machinery that cost $40,000 was valued at the end of eight years at $8,000. (a) What was the average annual depreciation? (b) What was the annual rate of depreciation?

4. A bankrupt's assets are $12,000 and his liabilities are $18,000. The cost of the bankruptcy proceedings is $800. How much will Blake receive if the bankrupt owes him $560.75?

5. A commission merchant was ordered by a confectioner to purchase 275 bags of sugar, each containing 100 pounds. The commission merchant purchased the sugar at 8.5 cents a pound and charged 4% commission. He paid the freight at the rate of

83 cents a bag and a handling charge of $69.50. (a) Find the total cost of the sugar to the confectioner. (b) Find, to the nearest tenth of a cent, the cost to the confectioner of a pound of sugar.

Group B

1. (a) What number divided by 84 gives 4.2? (b) Divide 252 by 12,000. (c) Multiply $36\frac{2}{3}$ by $21\frac{3}{4}$. (d) Express 3.6% as a common fraction. (e) $5.40 is what per cent greater than $2.40?

2. If the manufacturer desires a gross profit of 15% on the selling price, what should be his selling price of an article costing $13.94 to manufacture?

3. A manufacturer wishes to receive $4.55 for an article after allowing the wholesaler a trade discount of 30%. What should be the manufacturer's list price of the article?

4. The four departments of a glove factory occupy floor space as follows: cutting department, 2,000 sq. ft.; making department, 3,800 sq. ft.; examining department, 1,500 sq. ft.; shipping department, 2,200 sq. ft. The yearly heating cost for the entire factory is $2,185. If this expense is divided among the several departments according to floor space, find the amount that should be charged to each department.

5. Find the proceeds of a 3-month non-interest-bearing note for $1,250, dated November 8, and discounted on January 11.

Group C

1. (a) Express $102\frac{1}{2}$% in decimal form. (b) $16 is $\frac{1}{8}$% of what amount? (c) $16\frac{4}{5}$ is what part smaller than 28? (d) $2.66 is 5% less than what amount? (e) $9.45 is $\frac{2}{5}$ greater than what amount?

2. An article listed at $360, less $16\frac{2}{3}$%, was sold for $200 at a special inventory sale. What additional rate of discount was offered at the sale?

3. A manufacturer wishes to list an article so that the invoice price will be $1.38 after allowing a trade discount of 25%. What should be the list price?

4. It costs a manufacturer $17 to make a rug. At what price should he list the rug in his catalog to make a profit of 15% of the selling price after allowing a trade discount of $33\frac{1}{3}$%?

5. A desk that cost $35 has been selling for $45.50. The same type of desk costs $37.50 today. At what price should it be sold to make the same rate of profit on the cost?

6. A furniture company purchased 50 camp chairs at $2.80 each. After the chairs had been marked up 60% on the cost, 40 were sold. What should be the selling price of each of the remaining chairs so that the company's profit will be 50% of the total cost of all the chairs purchased?

Cumulative Review

1. On July 1, Albert Hard's bank statement had a balance of $710.35. His checkbook balance was $582.45. The following items appeared on the bank statement but not in the checkbook: $1.50 service charge, $95 note collected. A deposit of $95.25 was made on June 30 and was entered in the checkbook but not on the bank statement. Outstanding checks were: $28.90; $60.15; $40.60. Prepare a reconciliation statement.

2. A man is getting $1.23½ an hour working a 40-hour week. How much must he get an hour to secure the same wage if the working week is reduced to 38 hours?

3. A manufacturing company pays its employees time and a half for overtime. Regular factory hours are 8 hours a day from Monday to Friday, inclusive. During the week of June 7, Bert Boyd was employed as follows: Monday 9 hours, Tuesday 8 hours, Wednesday 6½ hours, Thursday 9½ hours, Friday 8½ hours. If Boyd's regular wage rate was $1.60 an hour, what was the amount of his wages for the week?

4. Frank Cole accepted a position as salesman with Nixon Brothers at a salary of $50 a week and a commission of 2½% on total sales in excess of $3,000 in any single week. His traveling expenses, not to exceed $40 a week, are paid by the firm. At the end of the first week he submitted to the firm his report showing total sales amounting to $5,700 and total traveling expenses amounting to $42.50. (a) What was the total amount of Cole's earnings for the first week? (b) What total amount did the firm owe Cole at the end of the first week?

5. The Mohawk Agency offered Hill, a salesman, a monthly salary of $100 and 4% commission on all sales. Martin Brothers offered Hill a commission of 5% on the first $5,000 of sales and 6% commission on all sales in excess of $5,000. (a) If Hill's sales averaged $6,800 a month, from which agency would he have received the greater income? (b) How much more per month would Hill have earned in the better-paying position?

6. A man borrowed $500 for two months. The interest charge was $3.75. What rate of interest did he pay?

7. On June 24, the First Trust Company discounted Robert Hardy's 80-day non-interest-bearing note for $725, dated June 24, and credited the proceeds to Mr. Hardy's account. (a) What amount was credited to his account? (b) What was the due date of the note?

8. A mortgage amounting to $3,400 bears interest at $4\frac{3}{4}$%, payable quarterly. What amount of interest is due on each interest date?

9. Mr. Ernest Tucker purchases from Boardman & Gray a piano priced at $980, making a down payment of 25%. (a) What is the amount of the down payment? (b) What is the unpaid balance? (c) Mr. Tucker agrees to pay the unpaid balance plus a carrying charge in 15 equal monthly payments. The carrying charge is to be applied in the form of interest on the unpaid balance at the rate of 6% per annum for 15 months, the number of months from the date of the purchase to the date of the last payment. What is the amount of the carrying charge? (d) Find to the nearest cent the amount of each monthly payment.

10. First mortgage $3\frac{3}{4}$% bonds, $1,000 par value, of the American Utility Company can be bought for $93\frac{1}{2}$ plus $2.50 brokerage fee per bond. (a) What is the rate of return on the bond? (b) How much money must be invested in these bonds to secure an annual income of $1,800?

11. What monthly rental must be charged for a house costing $11,500 to realize a net income of 7% on the investment if the annual expenses amount to $575?

12. Larkin purchased a house for $10,500, paying $4,000 in cash and giving a $4\frac{1}{2}$% mortgage for the balance. He rented the house for $87.50 a month. If the annual expenses for taxes, insurance, repairs, etc. amounted to $578, what rate of return, to the nearest tenth per cent, did Larkin realize on his investment?

13. During one winter it cost Williams $215 to heat his house with coal. The following year he installed an oil burner that cost $350. His heating expenses for that year were: 1,600 gallons of oil at 12.5¢ a gallon; 140 K.W.H. of electricity at 5¢ a K.W.H.; depreciation at 10% of the cost of the burner; interest on his investment at 4%. How much more did it cost Williams to heat with oil?

14. The assessed valuation of property in a certain village is $10,769,250. The total amount needed to meet the budget for the coming year is $439,983. The estimated amount of receipts from various sources is $88,428. (a) Find the tax rate per $1,000.

(b) James Leonard owns two pieces of property in this village, valued at \$9,600 and \$8,400, respectively, and assessed at 80% of their value. Find the total tax that he must pay.

15. Find the single discount that is equivalent to successive discounts of 20%, 15%, and 10%.

16. On January 7, C. H. Rowley purchased an invoice of merchandise amounting to \$1,500, less 20% and 10%, on terms 2/10, n/30. In order to pay for the goods on January 17 and take advantage of the cash discount, Rowley had to borrow the money from his bank, giving his 20-day interest-bearing note. (a) By borrowing the money to take advantage of the discount, did Rowley gain or lose? (b) How much did he gain or lose?

17. While a certain shoe was selling at \$13 a pair, a store sold an average of 10 pairs a day. By reducing the price to \$12.50, the store increased its sales to 15 pairs a day, with no increase in selling expense. The shoes cost \$6.30 a pair. (a) By how much was the daily profit increased or decreased? (b) Find, correct to the nearest tenth per cent, the per cent of increase or decrease in the daily profit on this line of shoes.

18. A retail dry goods merchant purchased a piece of cloth containing 50 yards at 72¢ per yard. He estimates that 4% of its length will be lost because of careless measuring and cutting by his sales clerks. At what price per yard must the cloth be sold to gain 40% on the selling price?

19. The Star Clothing Shop bought an odd lot of men's clothing, consisting of 150 summer suits, for \$2,550. After the suits had been marked up 40% on the cost, 100 of them were sold. At what price must each of the remaining suits be sold in order to gain 25% on the cost of the entire lot?

20. A tire dealer paid \$24 each for tires that he had been selling at \$32. The same tire now costs the dealer \$30. At what price should he sell it to make the same rate of profit?

21. If a merchant marks goods $33\frac{1}{3}\%$ above cost and then allows a discount of 10%, what is his per cent of gain reckoned on (a) the cost and (b) the selling price?

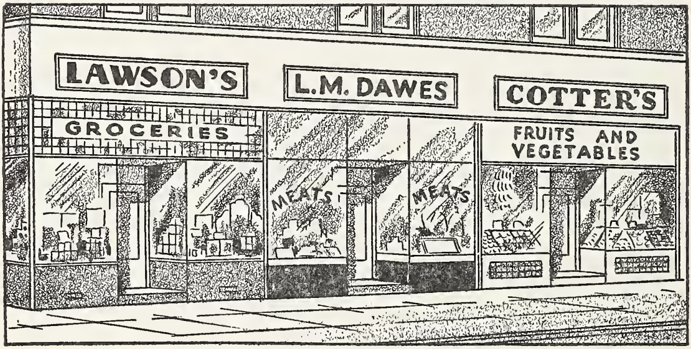
22. On April 24, James Hardy was advised by his bank that he had overdrawn his account \$43.67. He immediately discounted at 6% a customer's two-month note for \$936 dated April 5, bearing interest at 5%. (a) What were the proceeds of the discounted note? (b) What was Hardy's new bank balance?

UNIT XIII

PROBLEMS IN BUSINESS OWNERSHIP

Section 1 . Sole Proprietorships and Partnerships

Sole Proprietorship. When a business is owned by one person, the organization is known as a *sole proprietorship.*



Single Proprietorships

Lawson's balance sheet shows the financial condition of his business at the end of his first year's operations.

CARL LAWSON

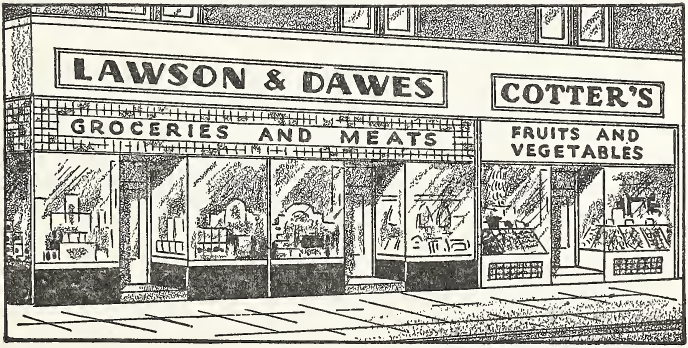
BALANCE SHEET, DECEMBER 31, 19--

Assets		*Liabilities*	
Cash	1,020	Accounts Payable	370
Accounts Receivable	1,270		
Merchandise Inventory	4,150	*Proprietorship*	
Furniture and Fixtures	2,730	Carl Lawson, Capital	10,000
Delivery Equipment	1,200		
Total Assets	10,370	Total Liab. & Prop.	10,370

Partnership. Two or more individuals may join together and operate a business as a *partnership*. When they do this, they usually engage a lawyer to draw up a contract called a *partnership agreement*. The agreement, which is signed by the partners, should contain all the information needed to show the interest, responsibilities, and duties of each partner, and the basis on which the partners are to share the profits and losses.

Formation of a Partnership. On page 448 you found Carl Lawson operating a grocery store as a sole proprietor. His business has grown to such an extent that he now desires to form a partnership with L. M. Dawes, the proprietor of the adjacent meat market. This association not only will provide the new concern with a larger total capital, but also will make possible an increase in the total volume of business. The new firm will be able to sell both groceries and meats to customers of the original two stores and should be able to attract new customers as a result of being able to offer a more complete service. A new location is not necessary as the two adjoining stores can be made into one.

Mr. Dawes is receptive to the plan and agrees to the terms of the partnership as expressed in the partnership contract. He invests the assets included in his meat market together with sufficient additional cash to make his total investment equal to $6,000.00. After certain necessary alterations in their adjoining stores, the partnership business under the name of "Lawson & Dawes" is established and is shown in the following illustration.



A Partnership Is Formed

The balance sheet of the partnership at the beginning of the partnership operations is shown below.

LAWSON & DAWES

BALANCE SHEET, JANUARY 1, 19--

Assets		*Liabilities*	
Cash	2,540	Accounts Payable	620
Accounts Receivable	1,930	*Proprietorship*	
Merchandise Inventory	6,955	Carl Lawson, Capital	10,000
Furniture and Fixtures	3,195	L. M. Dawes, Capital	6,000
Delivery Equipment	2,000		
Total Assets	16,620	Total Liab. & Prop.	16,620

Exercise 1. (*Written*)

1. On March 1 of the current year, C. L. Martin and M. E. Lee entered into a partnership. The partnership assets and liabilities on that date were: cash, $1,150; accounts receivable, $655; merchandise inventory, $8,420; furniture and fixtures, $3,985; delivery equipment, $2,435; accounts payable, $985. Martin's capital was $10,440, and Lee's, $5,220. Prepare the partnership balance sheet.

2. A. O. Green and W. C. Baxter form the partnership of Green & Baxter on June 1 of the current year. The firm's assets and liabilities consist of the following: cash, $2,372; accounts receivable, $1,147; merchandise inventory, $15,681; store equipment, $6,935; office equipment, $825; supplies, $103; accounts payable, $1,563. Green's capital is $13,600 and Baxter's, $11,900. Prepare the June 1 balance sheet of the partnership.

Distribution of Partnership Profits and Losses. The basis on which partners are to share profits and losses should be stated clearly in the partnership agreement. If the agreement does not specify any particular method, the law requires that the partners share the profits and losses equally. Four commonly used methods of distribution are:

1. In equal proportions.
2. In proportion to investments.
3. In equal proportions after allowing the partners interest on their investments.
4. In equal proportions after allowing salaries to the partners and interest on their investments.

Profits Distributed in Proportion to Investments. To find the amount a partner should receive when profits are distributed in proportion to investments, first express his investment, or capital, as a fractional part of the total capital of the partnership. Then multiply that fraction by the total partnership profit.

Example: Lawson and Dawes entered into a partnership with investments of $10,000 and $6,000, respectively. The partners agree to share profits and losses in proportion to their investments. At the end of the first year, the partnership books show a net profit of $7,200. Find each partner's share of the net profit.

Solution:		
	Lawson's investment	*$10,000*
	Dawes's investment	*6,000*
	Total investment	*$16,000*

$$\text{Lawson's share} = \frac{\$10{,}000}{\$16{,}000} \times \$7{,}200 = \tfrac{5}{8} \times \$7{,}200 = \$4{,}500$$

$$\text{Dawes's share} = \frac{\$6{,}000}{\$16{,}000} \times \$7{,}200 = \tfrac{3}{8} \times \$7{,}200 = \$2{,}700$$

Proof: $4,500 + $2,700 = $7,200, total profit

Exercise 2. (*Written*)

1. Jones and Brown, partners, invested $3,000 and $5,000, respectively, agreeing to share the profits in proportion to their investments. If the net profit was $4,800, what was each partner's share?

2. Bell and Carr are partners sharing profits and losses according to their investments. Bell's investment is $6,550, and Carr's is $6,150. Their net profit for the first year's operations is $6,340.75. Find each partner's share of the profit.

3. In the partnership of Hayden & Stone, profits and losses are shared according to the investments. Hayden's investment is $6,000 and Stone's, $5,250. During one year the net profit is $8,175. What is each partner's share of the profit?

4. The partnership agreement of A, B, and C stated that profits and losses were to be shared in proportion to investments. A invested $9,000; B invested $18,000; C invested $27,000. The profits of the partnership for the year ending April 30 were $12,360.30. What was each partner's share?

5. On June 1, Brown, Johnson, and Wood entered into partnership. Brown invested \$4,800, Johnson \$5,600, and Wood \$7,600. The partners agreed to share profits in proportion to their respective investments. At the end of the year, the gross profit on sales amounted to \$7,779.50. The expenses for the year amounted to \$2,019.50. (a) Find the firm's net profit for the year. (b) Find Brown's share of the net profit. (c) Find Johnson's share of the net profit. (d) Find Wood's share of the net profit.

6. Davidson and Lee entered into a partnership, investing \$8,000 and \$4,000, respectively. At the end of the year the total sales amounted to \$18,525, cost of goods sold was \$12,200, and overhead expenses were \$1,522. If the profit was to be divided according to the investment, find each partner's share of the profit.

Profits Distributed Equally After Allowing Interest on Investments. When the partners' investments are different but the partners' services are considered to be of equal value to the business, it is common practice to allow each partner interest on his investment and then divide the remainder of the profit equally among the partners. This method provides a more equitable division of the profits than does either the method of equal distribution or distribution in proportion to the investments.

Example: E. J. Gale and G. A. Peck form a partnership, investing \$20,000 and \$15,000, respectively. They agree to allow each partner 6% interest on his investment and to divide the remainder of the profit equally. The net profit for the first year is \$9,500. Find each partner's share of the profit.

Solution

(1)	*Gale's interest (6% of \$20,000)*	*\$1,200*
	Peck's interest (6% of \$15,000)	*900*
	Total interest	*\$2,100*

(2)	*Net Profit*	*\$9,500*
	Interest	*2,100*
	Remainder	*\$7,400*

(3) *\$7,400 ÷ 2 = \$3,700, each partner's share of remainder*

(4)	*Gale's interest*	*\$1,200*	*Peck's interest*	*\$ 900*
	Share of remainder	*3,700*	*Share of remainder*	*3,700*
	Gale's total share	*\$4,900*	*Peck's total share*	*\$4,600*

Proof: \$4,900 + \$4,600 = \$9,500, total profit

Exercise 3. (*Written*)

1. Todd invested $12,000 and Olsen $15,000 in the clothing store of Todd and Olsen. They agreed that in apportioning profits they would allow a return of 8% interest on their investments and share the remaining profits equally. (a) How much must the business earn in one year to cover the 8% interest on the total investment? (b) The partnership profit at the end of the first year was $5,380. Find each partner's total share.

2. On January 2, Wilson and Smith entered into a partnership for the purpose of conducting an automobile sales and repair business. Wilson invested $10,500 and Smith $7,500. It was agreed that each partner should receive 6% on his investment and that the remaining profit or loss should be divided equally between the partners. At the end of the year, income from sales amounted to $10,287.63, income from repairs $1,428.12, and expenses $3,255.75. (a) Find the firm's net profit for the year. (b) Find Wilson's total income for the year. (c) Find Smith's total income for the year.

3. On January 1 of last year, Clark, Brown, and Ryan entered into a partnership. Clark invested $6,000, Brown $4,500, and Ryan $7,500. It was agreed that each partner should receive 6% annually on his investment and that the remaining profit or loss should be divided equally among the partners. At the end of the year, the gross profit on sales amounted to $6,975 and other income $623. The expenses for the year amounted to $2,252. (a) Find the firm's net profit for the year. (b) Find Clark's total income for the year. (c) Find Brown's total income for the year. (d) Find Ryan's total income for the year.

4. Brown, Smith, and Jones formed a partnership to conduct a retail business. They invested $5,000, $10,000, and $20,000, respectively. At the end of the first year their gross profits were $8,340 and their expenses were $1,340. (a) If each partner received 5% interest on his investment and the remaining profits were shared equally, what was each partner's total share of the net profit? (b) If the partners had agreed that profits and losses were to be shared in proportion to the investments with no allowances for interest, what would have been Brown's share of the profit?

5. Clark, Evers, and Chase were considering the formation of a partnership with respective capital investments of $8,000, $10,000, and $12,000. Clark suggested that the profits be divided equally. Evers suggested that the profits be divided according to the investments. Chase suggested that each partner should receive 6% interest on his investment and the remainder of the profit should be divided equally. Assume that the firm would make an annual net profit of $15,000. (a) How much would Chase receive if the profits were divided equally? (b) What would be Chase's share of the profits if they were divided according to the investments? (c) What would be Chase's total income if the profits were divided according to his own plan?

Profits Distributed Equally After Allowing Salaries to the Partners and Interest on the Investments. When there are differences in both the investments and the value of the partners' services, an equitable division of the profit can be obtained by allowing salaries and interest to the partners and dividing the remainder of the profit equally. Under this method, the sum of the salaries and the interest allowances is subtracted from the total partnership profit. The remainder is then divided equally among the partners. Each partner's total share of the profit is represented by the sum of his salary, interest allowance, and share of the remainder.

Exercise 4. (Written)

1. Johnson and Weston are partners with investments of $10,000 and $15,000, respectively. They are to receive monthly salaries of $300 for Johnson and $200 for Weston and 6% interest per year on their investments. After salaries and interest have been deducted, the remaining net profit is to be shared equally. During the year ended last December 31, the partnership net profit amounted to $9,900. Find each partner's total income from the business for the year.

2. Gates and Hart formed a partnership, Gates investing $11,500 and Hart $7,500. It was agreed that each should receive 5% interest per year on his investment, Hart should receive a salary of $1,200 per year, and the remaining net profit should be divided equally. The net profit for the first year was $4,650. (a) How much of this did Gates receive? (b) What was Hart's total income?

3. Johnson and Harworth are partners in business with respective investments of $18,000 and $12,000. Their partnership agreement provides that Harworth shall receive a monthly salary of $100 for special services, that interest shall be allowed on their investments at the rate of 6% per annum, and that the profit shall then be divided equally. For the period of three months ending May 31, the total profit was $5,436.80. How should this total profit be divided between the two partners?

4. In the Erie Specialty Company, Groves invested $12,000, Brown $10,000, and Curtis his services. Out of the profits for the first year, which amounted to $8,100, Curtis was allowed $1,200 for services and Groves and Brown 15% each on their investments as interest on capital. The remainder of the profits was divided equally among the three partners. Find the amount of each partner's total income from the business.

5. Edward Brown, Samuel Jones, and Frank Wheeler formed a partnership. Brown invested $12,000, Jones $10,000, and Wheeler his services. At the end of the year, the books showed a profit on sales of $12,483, other income $690, and expenses $3,780. The net profit was apportioned as follows: Wheeler $1,200 for services and Brown and Jones 15% each on their investments as interest on capital. The remainder of the profits was divided equally among the three partners. Find the amount of each partner's total income from the business.

Problems for Application and Review

Group A

1. (a) What amount is 115% greater than $36? (b) What per cent is equivalent to $7\frac{1}{2}$? (c) $12.60 is $\frac{7}{12}$ of what amount? (d) Divide $46\frac{2}{3}$ by $8\frac{1}{3}$. (e) $44 is 60% more than what amount?

2. Three partners, Grant, Waite, and Clogston, invested $16,000, $18,000, and $20,000, respectively, in a retail clothing business. Their gross profits for a year were $64,000, and their expenses were $42,400. They are to share the gains and losses in proportion to their investments. How much of the net profit should each partner receive?

3. An article is listed at $48, less a trade discount of $16\frac{2}{3}\%$. The market price of the article drops to $28 net. What additional discount must be offered to meet this price?

4. In figuring the price for shoes, the Hanson Shoe Company used the following manufacturing costs per pair: labor, $1.90; leather and trimmings, $2.30; factory overhead, $.60. They estimated the selling and management expenses at 15% of sales. What price per pair did the company quote for the shoes in order to make a net profit of 10% of the selling price?

5. Johnson & Company of New York received from a grower in Florida a carload of lettuce to be sold on commission. The car contained 650 crates. Freight and other charges paid by Johnson & Company amounted to $510. Johnson & Company sold 275 crates at $3.40, 200 crates at $3.20, 150 crates at $2.80, and the remainder at $1.84 a crate. After deducting 5% commission and the other charges, Johnson & Company remitted the proceeds to the grower. (a) What amount did the grower receive? (b) What was the average selling price per crate that Johnson & Company received for the entire consignment?

Group B

1. (a) $1.68 is $\frac{1}{4}$ less than what amount? (b) 32 is what per cent of $10\frac{2}{3}$? (c) .65 times what number gives 104? (d) Find $\frac{3}{4}$% of $472. (e) Express .064 as a common fraction (f) What number multiplied by $2\frac{3}{4}$ gives 88? (g) Divide $21\frac{1}{9}$ by $6\frac{1}{3}$.

2. Cole, White, and Hadley formed a partnership with investments as follows: Cole, $22,500; White $37,500; Hadley, $15,000. During the first year, profits were made as follows: from sale of merchandise, $22,275; interest on notes receivable, $1,416.75; commissions earned, $28,417.50. If the cost of conducting the business during the year was $18,122.25 and the net profit was to be shared in proportion to the partners' investments, how much money did each partner receive?

3. Blair, Rose, and Ward entered into a partnership on January 1. Blair invested $14,400, Rose $9,600, and Ward $24,000. It was agreed that each partner should receive 5% annually on his investment, and that the remaining profit or loss should be divided equally among the partners. At the end of the year, the books showed a profit on sales of $19,376, other income $1,184, and expenses $5,260. What was each partner's total income for the year?

4. The Empire Sales Company has been selling refrigerators at $160, less 25%. To meet competition, the Empire Sales Company decides to allow a second discount so that the refrigerators may be sold at $110.40. Express as a rate per cent the second discount that the company must offer.

5. If machinery costing $7,520 can be sold at the end of 4 years for $4,512, find the annual rate of depreciation.

6. If discounted at 6% on August 29, what were the proceeds of a 90-day note for $526.10, dated July 15, with interest at 5%?

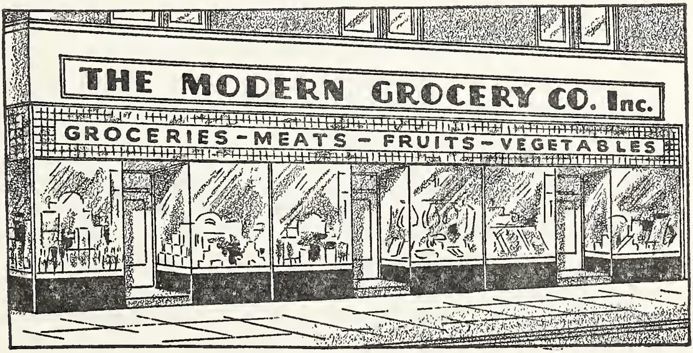
Section 2 . . . Corporations and Co-operatives

Corporation Charter. In addition to the single proprietorship and partnership form of organization, a business may be organized as a corporation. Authority to organize a corporation is granted by the state and is evidenced by an agreement between the state and the parties who make application to incorporate. This contract, called a *charter*, states the nature of the corporation's business and the par value and the number of shares that may be issued.

Formation of a Corporation. In the preceding section you saw how the business of Mr. Lawson grew and how Mr. Dawes was admitted as a partner. The partnership of Lawson and Dawes has continued to thrive, and the partners extend an invitation to Mr. Cotter to join the enterprise.

Realizing that more capital will be required, Lawson, Dawes, and Cotter make application to the secretary of state for a charter to incorporate for $100,000 under the name of The Modern Grocery Company, Incorporated.

The capital stock of $100,000 is to be divided into 1,000 shares, each with a par value of $100. The three incorporators are to receive 250 shares each in exchange for the value of their present businesses. The remaining 250 shares are to be sold as additional cash is needed.


THE MODERN GROCERY CO. Inc.
GROCERIES – MEATS – FRUITS – VEGETABLES

A Corporation Is Created

As soon as the corporation charter is received, the building is altered to include the space recently occupied by Mr. Cotter.

At the end of the first year the corporation has sold all of its 1,000 shares. The financial condition of the company is shown by the following balance sheet.

THE MODERN GROCERY COMPANY, INC.
BALANCE SHEET, DECEMBER 31, 19--

Assets		*Liabilities*	
Cash	9,900	Accounts Payable	13,900
Accounts Receivable	10,800		
Merchandise Inventory	56,500	*Proprietorship*	
Office Equipment	2,200	Capital Stock	100,000
Store Fixtures	15,000	Surplus	12,500
Delivery Equipment	4,500		
Land and Buildings	27,000		
Supplies	400		
Total Assets	126,400	Total Liab. and Prop.	126,400

Surplus and Dividends. At regular intervals, at least as often as once a year, the net profit is computed and recorded in an account called *Surplus.*

In the foregoing balance sheet, the item "Surplus" is shown in the proprietorship section and is seen to be $12,500.

The directors of the corporation then decide how much of the profit is to be apportioned to the stockholders and how much is to be retained by the corporation for expansion and improvements or for future emergencies.

The profit apportioned to the stockholders is called a *dividend.* The *rate of dividend* may be expressed as a per cent of the par value of the shares, or it may be expressed in terms of dollars and cents per share.

To Find the Rate of Dividend. To find the rate of dividend, divide the total dividend by the par value of the capital stock if the dividend is to be expressed in the form of a per cent. If the dividend is to be expressed in terms of dollars and cents per share, divide the total dividend by the number of shares.

In the following examples and problems it is assumed that the corporation has sold all of the shares of stock authorized by the charter.

Example: The Modern Grocery Company, Inc., with capital stock of $100,000 (1,000 shares at $100 par value per share) has a net profit of $12,500 for the first year's operations. What rate of dividend may be declared if the entire net profit is to be paid to the stockholders?

Solution

$12,500 ÷ $100,000 = .125 = 12.5%, rate expressed in per cent

or

$12,500 ÷ 1,000 = $12.50, rate in dollars and cents per share

To Find the Total Dividend and the Amount Retained in the Surplus Account. As a rule only a part of the net profit is apportioned to the stockholders, the remainder being retained by the corporation.

Example: The Modern Grocery Company, Inc., with capital stock of $100,000, has a net profit of $12,500 for the first year's operations. The directors vote to pay a 7% dividend and to keep the remainder of the profit in the surplus account. Find (a) the total dividend and (b) the amount kept in the surplus account.

Solution

(a) 7% of $100,000 =
$7,000, total dividend

(b) $12,500, net profit
7,000, total dividend
$ 5,500, kept in surplus

Exercise 5. (*Written*)

1. The books of the Maxwell Corporation, whose capital consists of 2,500 shares, each with a par value of $100, showed a net profit of $14,650.28 for last year. The directors voted to pay a dividend of $8,750 to the stockholders and to keep the remainder of the profit in the surplus account. (a) What rate of dividend did the directors declare, expressed as a per cent? (b) What amount was kept in the surplus account? (c) What total dividend was received by G. M. Alden who owns 40 shares?

2. Last year the Bemis Corporation, which is capitalized at $450,000, made a net profit of $37,843.60. The directors declared a 5% dividend and voted to keep the remainder of the profit in the surplus account. Find (a) the total dividend payment to the stockholders, (b) the amount kept in the surplus account, and (c) the dividend received by A. L. Borden who owns 75 shares, each with a par value of $50.

3. A corporation, whose capital consists of 135,000 shares at $10 par value per share, shows a net profit of $31,865.75 for a certain period. The directors decide to declare a dividend of 17½ cents per share and to keep the remainder of the profit in the surplus account. Find (a) the amount kept in the surplus account and (b) the dividend received by R. O. Craig who holds 150 shares of the stock.

4. The capital stock of the J. B. Williams Company, Incorporated, consists of 2,000 shares of 5% preferred stock (par value $100 per share) and 50,000 shares of common stock (no-par-value). For the year ending last December 31, the corporation's net profit was $52,816.82. The directors declared the regular 5% dividend on the preferred stock and a dividend of 35¢ per share on the common. The remaining net profit was kept in the surplus account. (a) How much was kept in the surplus account? (b) What was the total dividend received by a stockholder who owned 25 shares of the preferred stock and 125 shares of the common?

5. The capital of the Newport Manufacturing Company consists of 3,000 shares of 6% preferred stock (par value $50 per share) and 25,000 shares of common (par value $20 per share). At the end of one year's operations, the corporation's books show a net profit of $61,318.70; and the directors declare the regular 6% dividend on the preferred stock. (a) How much of the net profit is available for distribution to the holders of the common stock? (b) If the directors declare a 7% dividend on the common stock and vote to keep the remaining profit in the surplus account, what amount is kept in the surplus account?

Exercise 6. (*Written*)

1. A corporation, whose capital stock consists of 8,000 shares, each with a par value of $50, has a net profit of $39,895.60 for a one-year period. What rate of dividend, expressed as a per cent, may be declared if the directors decide to keep $9,895.60 of the net profit in the surplus account and to pay the remainder to the stockholders?

2. The books of the Dunlap Corporation show a net profit of $13,650 for the six months ending June 30. The capital stock of the corporation consists of 25,000 shares, par value of each share $5. What rate of dividend, expressed in cents per share may the directors declare if they decide to keep $3,650 of the net profit in the surplus account and pay the remainder to the stockholders?

3. The Regal Manufacturing Company, which is capitalized at $450,000, has a net profit of $46,125.75 for the year ending October 31. (a) What is the largest even per cent of dividend that can be paid out of the year's profit? (b) If the directors declare a 6% dividend and vote to keep the remainder in the surplus account, what is the amount kept in the surplus account?

4. The capital stock of the Nashua Spinning Company consists of $50,000 of preferred stock and $150,000 of common. The dividend rate on the preferred stock is fixed at 5%. If the company's net profit for one year is $16,435, what is the largest even per cent of dividend that can be paid on the common stock?

5. The capital stock of a corporation is $200,000, of which $75,000 is 6% preferred stock and $125,000 is common stock. The gross income for six months is $69,764, and the expenses $60,919. What is the largest even per cent of dividend that can be paid on the common stock?

Co-operatives. A business that is owned by its patrons is known as a co-operative. It is usually organized as a corporation with the stockholders as the patrons of the business. The net profits of the co-operative are distributed among the stockholders in two parts:

(1) A dividend on the capital stock, which is distributed to each stockholder in proportion to the number of shares he owns.

(2) A patronage or participation dividend, which is distributed to each stockholder in proportion to the amount of business he has done with the co-operative.

Exercise 7. (Written)

1. George Ellis, a farmer, is a member of the Hobart Consumers Co-operative Store. At the end of one year's operations, the directors of the co-operative declared a 5% dividend on the capital stock and a 4% patronage dividend on the sales to the store's customers. (a) How much dividend on the capital stock should Ellis receive if he owns ten shares of stock, the par value of each share being $20? (b) What should be the amount of his patronage dividend if he purchased $432.16 worth of goods from the co-operative during the year? (c) What is the total dividend he should receive from the co-operative?

2. At the end of last year's operations, the Altamont Retail Co-operative declared a 4% dividend on the capital stock and a 5% participation dividend. What total dividend should be received by Walter Ross who owns twelve shares of the capital stock, par value of each share $25, and who purchased $618.40 worth of merchandise from the co-operative during the year?

3. F. C. Dodge owns twenty-five shares of the local co-operative stock, par value of each share $5. He buys most of his groceries, gasoline, and oil from the co-operative. On June 30 the co-operative declared a 3% dividend on the capital stock and a 2% patronage dividend. What is the total dividend Dodge should receive if his purchases from the co-operative totaled $714.15?

4. The books of a co-operative retail store, capitalized at $20,000, show net sales of $61,152 for the year ending December 31 of last year, and a net profit of $5,846.25. The directors voted to declare a $4\frac{1}{2}$% dividend on the capital stock and a 6% participation dividend on the net sales. The remaining net profit was kept in the surplus account. (a) How much was kept in the surplus account? (b) How much dividend did Walter Young receive who owns fifteen shares of the co-operative stock (par value of each share $10) and whose purchases from the co-operative during the year amounted to $275?

Problems for Application and Review

Group A

1. (a) 156 is what per cent greater than 48? (b) What number divided by $\frac{4}{5}$ gives 40? (c) Express $\frac{1}{4}$% as a common fraction. (d) $32.40 is 35% more than what amount? (e) Multiply $36\frac{2}{3}$ by $14\frac{3}{4}$.

2. The books of a corporation capitalized at $200,000 show a net profit of $37,684.72 for the year. The directors declare a dividend of 8% and vote to keep the remainder of the profits in the surplus account. Find (a) the amount kept in the surplus account and (b) the dividend of Mr. Travis who owns 140 shares, par value $100.

3. Vincent, Dugan, and Carver have invested $12,000, $16,000, and $24,000, respectively, in their wholesale business. The first year their net profit was $15,600. (a) If they decide to divide their profits equally among themselves, how much would Dugan receive? (b) If they divided their profits in proportion to their investments, how much would Dugan receive? (c) If they allowed each partner 6% interest on his investment and then divided the remaining profit equally, how much would Dugan receive?

4. A catalog lists model number 10 camera at $22.50. What rate of discount can be allowed to make this camera cost the purchaser $20 net?

5. A department store has six departments. The annual rent of $12,000 is to be charged to the departments in proportion to the floor space occupied by each. The distribution of the floor space is as follows:

DEPARTMENT	SQUARE FEET OF SPACE	DEPARTMENT	SQUARE FEET OF SPACE
A	1,700	D	1,260
B	1,500	E	1,300
C	3,200	F	1,040

Find the amount of rent apportioned to each department.

Group B

1. (a) $4.80 is $\frac{3}{4}\%$ of what amount? (b) What amount is 35% more than $26? (c) $34.20 is 5% less than what amount? (d) Express $\frac{2}{3}\%$ as a common fraction. (e) What per cent is equivalent to $3\frac{3}{4}$?

2. A bank, whose capital consists of 3,000 shares at $100 each, shows a profit of $25,959.78 during a certain period. The directors decide to declare a 6% dividend, the remainder of the profit being kept in the surplus account. Find (a) the amount kept in the surplus account and (b) the amount of dividend received by Gates who holds 25 shares of the stock.

3. The capital stock of a corporation is $50,000, of which $25,000 is 6% preferred stock and $25,000 is common stock. The gross income for six months was $11,612. The expenses amounted to $7,147. How large an even per cent of dividend could be paid on the common stock?

4. Robert Sampson, James Graham, and Charles Toohey formed a partnership to conduct a mercantile business and invested $16,000, $20,000, and $24,000, respectively. At the end of the first year the statements showed that their gross profits were $30,820 and their expenses $7,600. The partnership agreement provides that gains and losses are to be shared in proportion to the investments. (a) What would be Sampson's share of the gain? (b) If each partner received 6% interest on his investment and then shared profits equally, what would be Sampson's share of the profits?

5. What must be the catalog price of an article costing $37.60 so that the manufacturer may make a profit of 20% on the selling price after allowing a discount of 20%?

Cumulative Review

1. On August 1, Graham & Wilkins received from their bank their monthly statement together with canceled checks. According to the statement, the bank balance was $2,628. The checkbook balance was $1,740.13. The following checks were outstanding: $324.13; $580.72; $49.70. The statement showed that the following items, which were not recorded in the checkbook, had been paid: a note for $56.04; a canceled check for $10; and a service charge amounting to 64 cents. Prepare a reconciliation statement.

2. The employees of the Johnson Gravel Company are paid on the basis of a 40-hour week with time and a half for overtime. During the month of April, Horace Belton worked 156 regular hours and 8 hours overtime; during May he worked 154 regular hours and 4 hours overtime; during June he worked 160 regular hours and 4 hours overtime. Belton's rate of pay is $1.55 an hour. Find Belton's total wages for the three months.

3. Jones Miller, a salesman, is paid a salary of $65 a week and a commission of $2\frac{1}{2}$% on total sales in excess of $3,000 in any single week. His traveling expenses, not to exceed $42 a week, are paid by the company. Miller submitted the following report for two weeks' work:

	SALES	TRAVELING EXPENSES
First week	$5,800	$38
Second week	6,200	45

(a) What was the total amount of Miller's earnings for the two weeks? (b) What total amount did the company owe him at the end of the two weeks?

4. A salesman has offers of employment from two firms. Kolapep offers him a salary of $200 a month, a commission of 5% on total monthly sales, and an additional 2% on monthly sales in excess of $4,000. Popsoda offers him a commission of 8% on the first $1,000 of monthly sales, 10% on the next $1,000 of monthly sales, and 12% on all monthly sales in excess of $2,000. (a) If his sales average $5,000 a month, in which position would he receive the greater income? (b) How much more per month would he earn in the better position?

5. Carl Bates held a 4% mortgage for $4,750 on the residence of Fred Rich. The mortgage was dated May 1, 1952, with interest payable semiannually. A notation of the following payments appeared on the bond that was attached to the mortgage:

November 1, 1952; interest due and $625 on the principal
May 1, 1953; interest due
November 1, 1953; interest due and $1,250 on the principal

(a) If no other additional payments were made, what amount was required to pay the mortgage in full on May 1, 1954? (b) What was the total amount of interest paid for the use of the money?

6. You wish to borrow $120. If you borrow $120 from a bank and pay $40 each month on the principal, the total interest and bank charges will be $2.75. A loan company will lend you $120, charging 3% a month interest on the unpaid balance. (a) If you borrow $120 from the loan company and pay $40 each month on the principal, what will be the total interest cost for the three months? (b) Which concern charges the larger amount? (c) How much larger?

7. The Music Shop sells Robert Downing a phonograph for $185. Mr. Downing pays $35 in cash, and the balance is to be paid in monthly installments of $25 plus interest at 6% per annum on the unpaid balance at the time of each monthly payment. In other words, the first monthly installment will include $25 plus the interest on $150 for one month; the second installment, $25 plus the interest on $125 for one month; etc. (a) How many payments are required to pay for the phonograph? (b) What is the amount paid each month? (c) What total amount does Mr. Downing pay for interest on the unpaid balance?

8. The Dover Savings Bank pays interest on its deposits at the rate of $2\frac{1}{2}$% a year and adds interest to the balance on the first of January, April, July, and October. On April 1, 1953, after interest was recorded, John Hay's balance was $935.40. On that day he deposited $250. On July 1 he deposited $175; and on October 1 he withdrew $200. (a) How much did he have on deposit on April 1, 1954? (b) What was his total interest for the year?

9. L. A. Ward wishes to establish a trust fund for his son's education. Mr. Ward has the opportunity to buy gas and electric bonds ($1,000 par value), bearing $4\frac{1}{2}$% interest, at $717.50 each, or railroad bonds ($1,000 par value) bearing 6% interest, at $1,037.50. The brokerage would be $2.50 for each bond. (a) Which bond would be the better investment and what would be the rate of income? (b) How much would Ward have to invest in these bonds to secure an annual income of $900?

10. Cramer owned 300 shares of Dumont Corporation stock. He authorized his broker to sell the stock at $179\frac{5}{8}$ and buy Central Utilities, $1,000 bonds at 96. The brokerage and taxes on the sale of the stock was $162.96, and the brokerage for buying the bonds was $2.50 per bond. (a) What were the proceeds from the sale of the stock? (b) How many bonds were purchased? (c) What was the unexpended balance?

11. A piece of real estate was purchased for $14,000. It was mortgaged for $7,000, assessed at $10,500, and insured for the value of the building, $11,000. (a) If the interest rate on the mortgage is $5\frac{1}{2}$%, the tax rate $22 per thousand, and the insurance rate 60¢ per hundred, find the annual cost of each of the following: interest; taxes; insurance. (b) In addition to the foregoing expenses, the repairs and depreciation amount to 2% of the value of the building. Find the total annual expenses.

12. The total annual rental of a piece of business property is $8,250. The annual expenses are $5,160. Assuming that the rent and expenses will remain the same, what is the highest price a buyer should pay for the property if he desires a net return of 6% on his investment.

13. A building valued at $22,500 was insured for $16,500 under an 80% coinsurance-clause policy. A fire caused a loss of $6,000. What amount was the insurance company required to pay?

14. The monthly rates for gas in a certain city are as follows: $1 per M for the first 5,000 cubic feet, $.80 per M for the next 5,000 cubic feet, and $.50 a thousand cubic feet for all additional gas consumed in a given month. Find the amount of M. R. Robinson's gas bill for the month of December if he used 22,150 cubic feet.

15. During one year, Merrill used 8.4 tons of coal in his furnace. Coal was $24 a ton and Merrill figured that his depreciation was $10 and service costs $4 a year. At the beginning of the next year he installed an automatic stoker at a cost of $475. His annual expenses were then as follows: interest at 6% on his investment in the stoker; depreciation, $48; 7.5 tons of coal at $16.50 a ton; service costs, $16; 216 kilowatt-hours of electrical energy at 5¢ a kilowatt-hour. (a) What was Merrill's annual heating cost before installing the stoker? (b) What was his annual cost after installing the stoker? (c) What was the per cent of increase or decrease in annual cost?

16. The records of the Bamer Hardware Store for the month of April show the following: sales, $6,820; purchases, $5,870; merchandise inventory April 1, $11,797; merchandise inventory

April 30, $12,618; operating expenses, $1,228. Find (a) the cost of goods sold for the month and (b) the net profit.

17. What single rate of discount is equivalent to successive discounts of 25%, 20%, and 10%?

18. On April 3, F. B. Clark purchased goods amounting to $1,500, less 20% and 10%, terms 1/10, n/30. Clark wished to pay the bill on April 13 so as to take advantage of the cash discount. As he had only $500 to spare, he borrowed the balance on his 20-day interest-bearing note. How much did he gain or lose by borrowing to take advantage of the discount?

19. A retailer can purchase an article for $9. He estimates that if he sells it at $12 he can sell 30 a week; that at $14 he can sell 25 a week; and that at $15 he can sell 20 a week. At which price will he make the largest weekly gross profit?

20. A dealer ordered two dozen barometers listed at $90 per dozen, less 20%. The dealer found $\frac{1}{2}$ dozen barometers defective and returned them for credit. The total buying expenses on the purchase were $4.32. If the dealer wished to make a profit of 40% on the selling price, at what price was each barometer sold?

21. A dealer receives notice from the manufacturer that the price of stoves has been advanced. The manufacturer's new price on model B-18 stove is $40, less 20% and 10%. At what price must the dealer mark this stove to make a profit of $33\frac{1}{3}$% on the selling price after allowing an advertised discount of 10% on the marked price?

22. An article listed by the manufacturer at $80 was purchased by a wholesale merchant less 30% and 10% discount. He resold it to a retail merchant at 25% off the same list price. What per cent profit, to the nearest tenth per cent, did the wholesale merchant make on the cost to him?

23. A produce dealer buys 50 barrels of potatoes at $4.20 a barrel. If he sells 10 barrels of partly damaged potatoes at $3.50 a barrel, what must he charge for the remainder in order to realize a profit of 30% on the cost of the entire lot?

24. Men's suits that cost $30 were sold for $48. If suits of the same grade cost $37.50 today, at what price should they be sold to make the same rate of profit?

25. On December 8, William Morton purchased an invoice of merchandise amounting to $1,282.50, subject to a discount of 2% if paid in 10 days. Morton's bank balance on December 18 was $432.50. He held A. W. Smith's 90-day non-interest-bearing note for $1,050, dated November 12. In order that he might have sufficient money with which to pay the invoice on December 18, Morton discounted Smith's note at the bank on that date and received credit for the proceeds. Morton then paid the invoice by check. (a) What was the amount of proceeds credited to Morton's account? (b) What was the amount of the check? (c) What was Morton's final bank balance?

26. A commission merchant bought 300 bags (100 lb. each) of potatoes for Douglas at \$2.50 per bag, charging him 5% commission. Other expenses incurred by Douglas were trucking and cartage \$64.80 and miscellaneous expense \$11.70. (a) Find the total cost of the potatoes to Douglas. (b) What must be the selling price of 25 lb. of potatoes to gain 33⅓% on the cost?

27. If machinery costing \$46,850 can be sold at the end of 10 years for \$24,500, what is the annual rate of depreciation, computed to the nearest tenth per cent?

28. Copy the following change sheet and indicate in the proper spaces the bills and coins to be secured from the bank to pay each man in cash.

CHANGE SHEET

NAME	NET WAGES	\$10	\$5	\$1	.50	.25	.10	.05	.01
P. C. Bradt	\$78.99								
R. S. Fisk	82.68								
T. E. Little	75.82								
L. J. Ryan	71.30								
TOTALS									

29. In filling an order for 5,000 pairs of shoes at \$6 a pair, the manufacturing costs were as follows: material, \$10,310; labor, \$11,769; overhead, \$2,821. (a) What was the average factory cost per pair? (b) If the selling and general administrative expenses were estimated at 12% of net sales, what was the factory's net profit on the order?

30. At what price should a manufacturer list an article if he desires to receive \$21.25 for it after allowing the dealer a trade discount of 37½%?

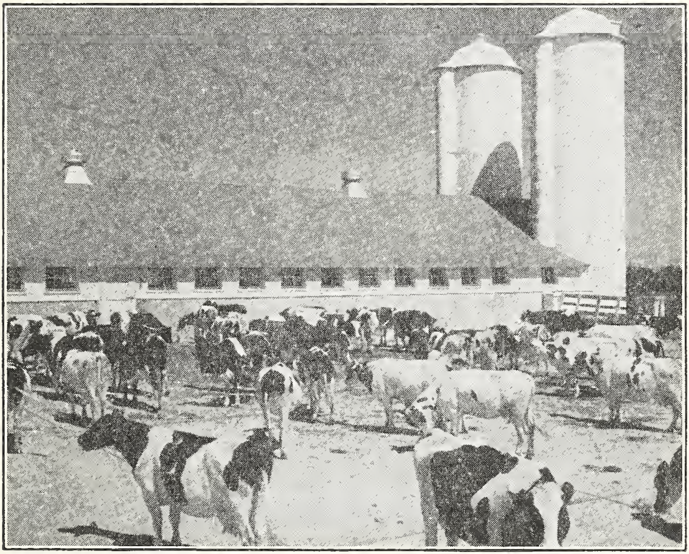
31. What must be the catalog price of an article costing \$18.60 so that the manufacturer may allow a discount of 16⅔% and still make a profit of 22½% on the selling price?

UNIT XIV

AGRICULTURE AND PETROLEUM INDUSTRIES

Section 1 . . . Farm Income and Expense

Profit and Loss Statement of a Farmer. The farmer is engaged in the business of raising and selling farm products at a profit. Like the merchant or manufacturer, the farmer should keep an accurate and complete record of his sales and expenses, and at regular intervals prepare a profit and loss statement to show the amount of net profit or net loss for the period.



Portland Credit Ass'n.

A Dairy Farm

A typical profit and loss statement of a farmer is shown in the illustration given below.

JOHN ERICKSON

Profit and Loss Statement

For the Year Ended December 31, 19--

Farm Income:		
Livestock Sales	$7,532	
Produce Sales	2,481	
Merchandise Received for Produce	104	
Miscellaneous Income	166	
Total Farm Income		$10,283
Farm Expenses:		
Labor Hired	$1,145	
Feed Purchased	1,291	
Seed	328	
Fertilizer	657	
Fuel and Oil (Farm Machinery)	262	
Repairs and Maintenance	176	
Taxes and Insurance	335	
Interest Expense	183	
Depreciation of Buildings	195	
Depreciation of Livestock	348	
Depreciation of Machinery and Equipment	554	
Miscellaneous Expense	251	
Total Farm Expenses		5,725
Net Farm Income		$ 4,558

Profit and Loss Statement of a Farmer

Cost of Production. When more than one kind of farm product is raised, it is desirable to keep separate income and expense records for each product in order that the profit on each may be computed.

Certain production expenses, such as taxes, insurance, depreciation, and farm supplies used, apply to the farm as a whole and are not direct expenses for any particular product. They are in the nature of overhead expenses and, at the end of the year or other fiscal period, must be distributed to the various products on some equitable basis. The table on page 471 shows the estimated percentages used on one farm for distributing the production expenses over the various farm products.

Production Expense	Poultry	Live-stock	Grain	Dairy Products
Taxes	5%	40%	40%	15%
Insurance	10%	50%	30%	10%
Depr. of Farm Equip.	5%	10%	60%	25%
Depr. of Farm Bldgs.	12%	60%	12%	16%
Farm Supplies Used	15%	50%	10%	25%

Exercise 1. (*Written*)

1. Seth Larson, a farmer, incurs the following costs in producing a crop of 210 bushels of potatoes: seed, $21.12; fertilizer, $28.28; man labor, $44.18; tractor labor, $7.45; spraying and dusting, $7.99; land use, $3.55; equipment, $14.31; other expenses, $2.83. Find (a) the total cost of production, and (b) the production cost per bushel.

2. Taxes on Herbert Margison's farm are $240. This expense is distributed among the cost of producing poultry, livestock, grain, and dairy products, respectively, according to the percentage distribution in the table shown above. What is the amount apportioned to the cost of producing (a) poultry? (b) livestock? (c) grain? (d) dairy products?

3. The depreciation of the buildings on Luther Skinner's farm amounts to $810. Mr. Skinner produces poultry, livestock, grain, and dairy products. Assuming that he apportions the depreciation according to the percentage distribution in the table shown above, find the amount apportioned to each product.

4. On a nine-acre field, a farmer produced 10.2 tons of canning peas which he sold to a canning factory at a contract price of $85.90 a ton. His records for the crop show the following: seed, $253.73; fertilizer, $134.84; man labor, $134.90; tractor labor, $37.12; use of truck, $11.42; use of other equipment, $61.63; land use, $73.55; other expenses, $89.71. Find (a) the total cost of production, (b) the cost of production per ton, (c) the cost of production per acre, (d) the net profit per ton, and (e) the net profit per acre.

5. In producing 1,060 bushels of corn on a 20-acre field, a farmer incurred the following expenses: seed $21.80; fertilizer, $316.80; man labor, $249.80; horse labor, $5.80; tractor labor, $128.60; other equipment, $122.40; hired harvesting, $29.00; land use, $122.80; storing and selling, $56.00; interest, $6.60; other expenses, $24.80. He sold the entire crop at $1.55 a bushel. (a) What was his average profit per bushel? (b) What was his average profit per acre?

Section 2 . . . Farm Management

Farm Management. The progressive farmer knows that a good knowledge of business arithmetic will aid him in solving his problems of finance and management. He may be required to determine whether it would be more profitable to purchase a farm or to invest the money elsewhere. He needs to know the best methods of obtaining and keeping on hand funds to meet his financial obligations promptly.

Exercise 2. (*Written*)

1. Henry Link was offered $1,900 in cash as rent of his farm. He decided, however, to rent the farm on a profit-sharing basis. During the season, his share of the expense was: seed, $245; fertilizer and lime, $525; repairs and replacements of tools and machinery, $195; miscellaneous expenses, $125. His share of the crop was sold for $3,680. How much did he gain or lose through renting his farm on a profit-sharing basis?

2. A 20-ton stack of hay, valued at $22.50 a ton, was left uncovered and, as a consequence, was damaged by heavy rains at an estimated loss of 20% of its value. It could have been covered with waterproof paper at a cost of $35. What would have been saved by covering the stack?

3. Leonard Williams, a farmer, owns a one-man baler which he is planning to use for doing custom work. He estimates that it will cost him $53 a day to operate the baler, $10.30 a day to operate the tractor which runs the baler, and $3 a day for miscellaneous expenses. He also estimates that he can bale an average of 30 tons of hay a day. What must he receive per ton for baling hay if he is to make a profit of $15 a day?

4. A farmer was offered $975 for his cotton crop before it was picked. Instead of accepting this offer, he had the cotton picked and ginned before it was sold. He obtained eight 500-pound bales of cotton, which he sold for $35\frac{1}{2}$¢ a pound, and cotton seed, which he sold for $183; less $22 for warehouse and selling charges. The expenses were $51.75 a bale for picking and hauling, and $13.50 for ginning. How much did he gain by having the cotton picked and ginned before it was sold?

5. Hogs are worth $18.20 a hundred pounds. (a) If a bushel of corn that may be sold for $1.62 will cause a hog to gain 10.5 pounds, should the farmer sell his corn or feed it to his hogs? (b) How much will he gain a bushel?

Marketing Farm Products. A farmer may market the products of his farm by selling them directly to the consumer, by selling through a commission merchant or other wholesale middleman, or by selling through a local co-operative marketing association.

Under the co-operative method, farmers organize a local association for the purpose of marketing their products co-operatively. When a farmer delivers produce to his co-operative, he may receive full payment at the current market price, less a deduction to cover the operating expenses of the association, or he may receive an initial payment of part of the value, receiving the balance after the association completes the sale of the produce. By co-operating in the marketing of their products, farmers in many instances are able to lower their marketing cost and to increase the market price received by them for their products.

Exercise 3. (*Written*)

1. During March, John Sullivan delivered to the Producers Dairy Marketing Association 9,550 pounds of milk testing 4.1% butterfat. The association paid $4.28 a hundred pounds for milk testing 4% butterfat or better, less 65¢ a hundred pounds to cover expenses. What did Mr. Sullivan receive for the milk?

2. During one season a co-operative grain elevator handled 284,300 bushels of wheat. At the end of the season there was a profit of $12,498.50 to be distributed as a patronage dividend. (a) Find the dividend in cents per bushel. (Carry the result correct to five decimal places.) (b) Find the dividend paid to Clifford Hope, who had delivered 2,675 bushels to the co-operative, and to Hugh Miller, who had delivered 1,760 bushels.

3. On August 2, Carl Engel delivered 852 bushels of wheat to his local grain-marketing association for storage. On November 10 he ordered it sold at $2.08½ a bushel less the association's storage and other charges amounting to $72.29. What amount should he receive in settlement of the transaction on November 10?

4. Clyde Hill, a farmer, delivered 470 bushels of oats to his local grain co-operative and received an initial payment of 64¢ a bushel. At the end of the month he received notice that the oats had been sold at an average price of 78½¢ a bushel, less $25.85 for handling charges. What amount did he receive in final settlement?

Dairying. Dairying is one of our most important agricultural industries and is carried on in all the states. The dairyman, by taking advantage of the results obtained from scientific research, has been able to improve the quality of milk produced by his herd and to lower the cost of its production.

Much of the milk produced on farms is sold to wholesale distributors or to manufacturers. Some of the principal manufactured dairy products are: butter, cheese, evaporated milk, condensed milk, powdered milk and cream, and ice cream.

Cattle Raising. The meat industry also has been growing in importance as a source of income to the farmer. For a long time much attention has been given to the raising of beef cattle in this country. In recent years many herds have been added to farms chiefly devoted to crop raising. The cost of raising cattle for market is much lower when the farmer can secure the greater portion of the necessary fodder from the crops on his own farm.

Exercise 4. (*Written*)

1. Henry Knapp has four dairy cows. He sells his milk to the Co-operative Dairy Marketing Association. Cow No. 1 averages 30 pounds of milk daily; cow No. 2, 28 pounds daily; cow No. 3, 26 pounds daily; and cow No. 4, 24 pounds daily. The price at which the milk is sold is $3.88 a hundred pounds for milk testing 3.5. The price increases 6¢ for each rise of a tenth in the test and decreases 6¢ for each fall of a tenth. The milk of Mr. Knapp's cows tests 4.7 for the month of January. What is the total amount of his milk check for the month of January if 45¢ a hundred pounds is deducted for handling?

2. The Jersey dairy herd of Lester Collins produced in a certain month 20,000 pounds of milk. If the average butterfat content of this milk was 5.3% and the price for a pound of butterfat was 79 cents, find the value of the butterfat produced by the herd.

3. When butterfat is churned, there is an overrun of about 24%; that is, the weight of the butter produced is about 24% greater than the weight of the butterfat churned. How many pounds of butter can be produced from 8,000 pounds of butterfat?

4. If butter is worth 69¢ a pound, find the value of the butter produced from a mixture of 3,000 pounds of milk containing

5.1% butterfat, 1,000 pounds of milk containing 4.75% butterfat, and 500 pounds of cream containing 26% butter fat. The overrun is the same as in Problem 3.

5. By the overrun in ice cream is meant the per cent of increase in the volume of the ice cream over the volume of the mix from which it is made.

The Lone Star Ice Cream Company manufactures ice cream in which the ingredients used in 30 gallons of the mix cost as follows:

Milk and cream	$29.50
Flavors, fruits, and nuts	5.00
Sugar and gelatin	4.50
Miscellaneous	1.50

If the overrun is 90%, what is the cost, to the nearest cent, of the ingredients in one quart of ice cream produced?

6. The number of pounds of Cheddar cheese (common American cheese) produced from a given quantity of milk is approximately 2.7 times the number of pounds of butterfat in the milk. Find the number of pounds of Cheddar cheese that can be produced from 6,000 pounds of milk containing 3.65% butterfat.

7. Lucius Tracy, a farmer, purchased 50 steers for fattening purposes, total purchase weight 34,350 lb., at $25.10 per cwt. At the end of 250 days he sold them at $30.20 per cwt., total sales weight 54,350 lb. Expenses connected with the venture were: feed, $4,650; labor, $475; interest, $430; buying and marketing expenses, $185; use of buildings and equipment, $490; general farm expense, $260; miscellaneous expense, $50. (a) What was his net profit on the venture? (b) What was the average daily gain in weight per steer? (c) What was the average feed cost for each hundred-weight of the added weight of the steers? (d) What was the average feed expense per day per steer?

8. The weight of the dressed carcass of a good steer is about 56% of the live weight. The principal cuts of the carcass and the per cent of the total weight of the carcass represented by each is given below:

Fore quarter		Hind quarter	
Chuck (incl. neck)	26%	Loin	17%
Rib	9%	Flank	4%
Plate and brisket	13%	Round	24%
Foreshank	4%	Suet	3%
Total	52%	Total	48%

Find the weight of each of these cuts obtained from a steer whose live weight was 1,250 pounds.

Terms Used in the Cotton Trade. The average weight of a bale of cotton is approximately 500 pounds. It is unusual to find a bale weighing less than 450 pounds or more than 550 pounds.

In the cotton trade it is customary to use certain abbreviations. Some of these are:

B/C	Bales of cotton
B/L	Bill of lading
F.O.B.	Free on board
M/B or B/M	Middling basis
Point	One hundredth of a cent

Government standards provide for nine grades of cotton. These grades and their abbreviations are as follows:

1. Middling Fair	M.F.
2. Strict Good Middling	S.G.M.
3. Good Middling	G.M.
4. Strict Middling	S.M.
5. Middling	M.
6. Strict Low Middling	S.L.M.
7. Low Middling	L.M.
8. Strict Good Ordinary	S.G.O.
9. Good Ordinary	G.O.

The fifth grade is the middle grade, hence the name "Middling." Unless otherwise stated, middling is the grade for which prices are quoted.

In making out a bill of sale for cotton it is customary to use a somewhat uniform general form containing abbreviations. The following is an illustration:

> James Foster sold 10 G.M. B/C, 5,050 lb., at $32\frac{1}{4}$¢ a pound. This means that the number of bales sold was 10, the grade of the cotton was good middling, the total weight of the 10 bales was 5,050 pounds, and the price of one pound was $32\frac{1}{4}$ cents.

Premiums and Discounts. The grades of cotton superior to middling sell at a premium, while those inferior to middling sell at a discount. The premium, or discount, is quoted in points a pound. If, then, cotton is selling at 40¢ a pound M/B, and the premium for strict good middling is 50 points, the latter grade will sell at $40\frac{1}{2}$¢ a pound.

An adjustment in price is also made for variations in the length of the staple, or fiber, of the cotton. A discount is deducted from the price of cotton if the length of the staple is less than $\frac{15}{16}$ inch, and a premium is allowed if the length of the staple is more than $\frac{15}{16}$ inch.

Exercise 5. (*Written*)

1. Find the total value of 2 S.M. B/C, 1,004 lb., at 39.08¢ a pound; 4 M. B/C, 1,985 lb., at 39.81¢ a pound; 3 M.F. B/C, 1,500 lb., at 39.31¢ a pound.

2. In a recent year the average premiums and discounts for grades of cotton above and below middling were as follows:

M.F.	80 points premium
S.G.M.	80 points premium
G.M.	80 points premium
S.M.	58 points premium
S.L.M.	191 points discount
L.M.	505 points discount
S.G.O.	722 points discount
G.O.	933 points discount

Lester Freeman sold 4 G.M. B/C, 2,000 lb.; 5 M. B/C, 2,550 lb.; 20 L.M. B/C, 10,500 lb. How much did he receive for this cotton at 38.50¢, M/B?

3. The average staple premiums and discounts for middling cotton in a recent year were as follows:

$\frac{13}{16}$ in.	141 points discount
$\frac{7}{8}$ in.	106 points discount
1 in.	52 points premium
$1\frac{1}{16}$ in.	107 points premium
$1\frac{1}{8}$ in.	279 points premium
$1\frac{3}{16}$ in.	669 points premium
$1\frac{1}{4}$ in.	1,275 points premium

Richard Hamilton sold middling cotton as follows: 5 bales, 2,500 lb., staple length 1 inch; 6 bales, 3,000 lb., staple length $1\frac{1}{16}$ inches; 10 bales, 5,000 lb., staple length $1\frac{1}{8}$ inches. Find the total amount of his premiums.

4. John Larkin owns 100 M. B/C, 50,400 lb. The price of cotton has declined 25 points since yesterday. Today, Mr. Larkin's cotton is worth how much less than it was worth yesterday? (By saying that the price of cotton has declined 25 points, we mean that the price has declined 25 points a pound.)

5. An advance of 24 points in the cotton market would mean how much increase in the value of 20 M. B/C, 10,500 lb.?

Fruits and Vegetables. The value of fruits and vegetables as human food is being brought daily to the attention of the public by research workers. This knowledge, together with improved facilities for transporting and storing perishable foods, has greatly increased the demand for these commodities while they are fresh.

Many of the states have found it desirable to regulate by law the packing and the sale of fruits and vegetables and to provide for standard weights and measures for them.

Appalachian Apple Service, Inc.

Harvesting Apples

In Texas, Florida, and California, as in many other states, legal specifications govern the kinds of containers to be used for packing fruits and vegetables and the dimensions and content of each container. Certain abbreviations are used in describing fruit packs. For example, standard orange packs are designated by 96's, 150's, 176's, 200's, 216's, 252's, and 288's, respectively. By 176's is meant that a standard crate contains 176 oranges of this size.

Exercise 6. (*Written*)

1. (a) If a grocer buys 5 baskets of 36's grapefruit at $2.70 a basket and retails the grapefruit at 10 cents each, what is the total amount of his profit? (b) The profit is what per cent of the sales price?

2. Mr. Jones buys 18 bushels of green corn at $1.60 a bushel. He sells this corn at 50 cents a dozen ears. If there are 50 ears of this corn in each bushel, what is the amount of his profit?

3. Some of the approximate weights per bushel of commodities in bulk, used by the United States Department of Agriculture, are as follows:

Apples	48 lb.	Peaches	48 lb.
Beans, snap	30 lb.	Peas, green, unshelled	30 lb.
Beets	52 lb.	Plums	56 lb.
Carrots	50 lb.	Potatoes, Irish	60 lb.
Corn, green, sweet	35 lb.	Potatoes, sweet	55 lb.
Cucumbers	48 lb.	Spinach	18 lb.
Onions	57 lb.	Tomatoes	53 lb.
Parsnips	50 lb.	Turnips	54 lb.

A grocer in Dallas bought 5 bu. of snap beans at $3.50; 2 bu. cucumbers at $3.35, and 4 bu. sweet potatoes at $4.10. He sold the beans at 11¢ a pound, the cucumbers at 9¢ a pound, and the potatoes at 10¢ a pound. What was the approximate amount of the grocer's profit or loss on (a) the beans? (b) the cucumbers? (c) the potatoes? and (b) the total purchase?

4. A merchant in San Francisco arranged to purchase fresh vegetables from several farmers living 35 miles outside the city. The merchant made arrangements for trucking the produce into the city at the rate of 80¢ a hundred pounds. His last shipment consisted of the following:

5 bu. beets
3 bu. carrots
6 bu. onions
5 bu. spinach
16 bu. tomatoes
4 bu. turnips

(a) What was the approximate weight of each item in the last shipment? (Use the table given in Problem 3.) (b) What was the approximate total weight of the shipment? (c) What was the approximate trucking charge made for this shipment?

Section 7 . . . 4-H Clubs

Boys' and girls' 4-H Clubs are found in every state that has an agricultural college. They are designed to teach through doing and are organized to teach the finer things of rural life as well as better practices in agriculture and home economics. Each member is required to undertake a specific project in farming or home economics, keep a record of the work, and make a public exhibit of the product. Prizes are given for the best products entered at the exhibit.

A 4-H Club Youth and His Prize-Winning Product

The following problems provide practice in ascertaining information needed by boys and girls engaged in 4-H Club work.

Exercise 7. (*Written*)

1. Dale Gibson, a member of the 4-H Potato Club, is undecided whether to use a fertilizer in his project. The cost of the fertilizer needed for his one-acre project is estimated at $35.50; but the use of the fertilizer is expected to increase his yield 20% and to improve the quality of the product. Potatoes of poor quality sell for $1.60 a bushel and potatoes of good quality sell for $1.90 a bushel. His yield without the use of the fertilizer will be 250 bushels. (a) How much more net income would he receive by the use of the fertilizer? (b) What per cent, to the nearest tenth, would he increase his income by the use of the fertilizer?

2. If farmers who have had experience as boys and girls in 4-H Clubs are able to earn incomes 6% above the average, how much will they receive annually if the average labor income of a farmer without this training is $3,850?

3. David received $84.40 as the income from his pig project. His cost and expenses, excluding his own labor, amounted to $68. (a) What was the amount of his profit? (b) What per cent of his income, to the nearest tenth, was this profit? (c) David spent twenty-one hours on the project, his labor being worth 60¢ an hour. What was his labor cost? (d) What was his net profit after deducting labor cost?

4. Royal Knox wishes to know the result of his Corn Club project. He had the following expenses: rent of ground, $12.10; seed, $4.50; fertilizer, $31.70; expenses of plowing ground, planting, cultivating, and gathering crop, $41.60; entry fee at county fair, $3.50. His income was as follows: sale of 3 bushels of seed corn at $3.50; sale of 95 bushels of corn on the market at $1.30; second-place premium at county fair, $4. (a) What was the total cost of his project? (b) The income? (c) The profit? (d) If he allowed himself 70¢ an hour for 42 hours spent on the project, what was his net profit after deducting labor cost?

5. Vera Mills, a member of the local 4-H Canning Club, borrowed $50 for six months at 5% in order to finance her project. Her expenses were: 7 dozen cans at $1.05 a dozen; vegetables and fruits used, $28.79; entry fees at fair exhibits, $4.50; transportation to exhibits, $2.50; rent of special exhibit space, $3.25. She received $5 as a premium for fair exhibits and $72.50 from the sale of her products to a local manufacturer for exhibit purposes. How much profit did Mary make from her project?

UNITED STATES DEPARTMENT OF AGRICULTURE
BUREAU OF DAIRY INDUSTRY

SCORE CARD FOR MILK AND CREAM

(APPROVED BY THE AMERICAN DAIRY SCIENCE ASSOCIATION)

*Place*____

*Class*__________________ *Exhibit No.*__________________

	Perfect Score	Score Allowed	Remarks
Flavor and odor.......	45	....	"Flavor defects" listed on other side ....
Bacteria..............	35	....	Bacteria found per milliliter ....
Sediment.............	10	....	....
Temperature.........	5	....	Degrees ....
Container and closure..	5	....	Container.................. Closure....................
Total..........	100	....	

*Exhibitor*____

*Address*____

(*Signed*) ____________________________________

____

____

Judges.

*Date*_________________

Score Card for Milk and Cream — Front

DIRECTIONS FOR SCORING

FLAVOR AND ODOR—PERFECT SCORE, 45

Deductions for disagreeable or foreign odor or flavor should be made according to conditions found When possible to recognize the cause, it should be described under "Remarks." The following may be used as a guide in scoring flavor:

Excellent: 40 and above; no criticism.
Good: 37 to 40; lacking special high flavor, flat, very slight feed, slight cooked.
Fair: 34 to 37; cooked, feed, salty, slight cowy, slight oxidized.
Poor: 25 to 34; strong feed, weedy, bitter, strong, musty, cowy, oxidized, very slight rancid.
Bad: 25 and below; rancid, strong cowy, high acid.
0; sour, putrid, or any flavor sufficiently strong to render the milk unfit for market purposes.

BACTERIA PER MILLILITER—PERFECT SCORE, 35

	Points		Points		Points
500 and under	35.0	11,100–12,000	32.7	36,000– 40,000	25.6
510– 1,000	34.9	12,100–13,000	32.5	41,000– 45,000	24.1
1,010– 1,500	34.8	13,100–14,000	32.3	46,000– 50,000	22.6
1,510– 2,000	34.7	14,100–15,000	32.1	51,000– 55,000	20.6
2,010– 2,500	34.6	15,100–16,000	31.9	56,000– 60,000	18.6
2,510– 3,000	34.5	16,100–17,000	31.7	61,000– 65,000	16.6
3,100– 3,500	34.4	17,100–18,000	31.5	66,000– 70,000	14.6
3,600– 4,000	34.3	18,100–19,000	31.3	71,000– 75,000	12.6
4,100– 4,500	34.2	19,100–20,000	31.1	76,000– 80,000	10.6
4,600– 5,000	34.1	20,100–21,000	30.9	81,000– 85,000	8.6
5,100– 6,000	33.9	21,100–22,000	30.7	86,000– 90,000	6.6
6,100– 7,000	33.7	22,100–23,000	30.5	91,000– 95,000	4.6
7,100– 8,000	33.5	23,100–24,000	30.3	96,000–100,000	2.6
8,100– 9,000	33.3	24,100–25,000	30.1	Over 100,000	0
9,100–10,000	33.1	25,100–30,000	28.6		
10,100–11,000	32.9	31,000–35,000	27.1		

SEDIMENT—PERFECT SCORE, 10

Examination for sediment shall be made by means of a sediment tester, and the resulting cotton disks compared with standards. When possible, the nature of the sediment should be described under "Remarks."

TEMPERATURE—PERFECT SCORE, 5

	Points		Points
50 degrees F. and below	5	57 to 60 degrees	1
51 to 53 degrees	4	Above 60 degrees	0
54 to 56 degrees	3		

CONTAINER AND CLOSURE—PERFECT SCORE, 5

Make deductions in score for dirty, leaky, dented, or chipped containers; and for closures which do not cover the lips of the containers or do not fit properly in the closure seats.

Note.—Any sample failing to comply with the legal standard for bacteria, fat, solids not fat, or total solids shall be debarred from competition.

U. S. GOVERNMENT PRINTING OFFICE 16—24004—1

Score Card for Milk and Cream — Back

Exercise 8. (*Written*)

In 4-H Club contests and similar competition, milk and cream may be scored on the basis of the information in the score card on page 482 and in the directions for scoring given on page 483. Use this information in solving the following problems. Assume in each case that the sample complies with the legal standard for bacteria, fat, solids not fat, or total solids.

1. William Freeman is an entrant in a cream contest. His sample of cream has a very slight feed flavor and is allowed a score of 39 for flavor and odor. It has a bacteria count of 28,000 and has no sediment. The temperature is 59 degrees. The score on the container and closure is "Perfect." What is the total score?

2. Elmer Cronk is an entrant in a milk contest. His sample of milk has the following characteristics:

Flavor and odor	Lacking special high flavor; score allowed, 38
Bacteria count	19,000 per milliliter
Sediment	A trace; score allowed, 9
Temperature	54 degrees F.
Container and closure	Dirty bottle; score allowed, 2

What is the total score?

3. Charles Oakley is an entrant in a cream contest. His sample of cream has the characteristics listed below:

Flavor and odor	No criticism, score allowed, 43
Bacteria count	26,000 per milliliter
Sediment	None
Temperature	56 degrees F.
Container and closure	Perfect score

Find the total score.

4. Albert Vadney is an entrant in a milk contest. The sample of milk has the following characteristics:

Flavor and odor	Allowed score of 44
Bacteria count	11,000 per milliliter
Sediment	None
Temperature	51 degrees F.
Container and closure	Bottle chipped slightly. Allowed a score of 4

Find the total score.

Section 8 . . . Petroleum Industry

Petroleum Industry. The activities in connection with the petroleum industry are varied. Chief among these activities are: exploring or prospecting for oil; acquiring oil rights, or buying or leasing land; drilling; producing; storing and transporting; refining; and selling.

Each activity has problems peculiar to itself. Within each activity, costs involved vary according to different sections of the country or even particular situations within one section of the country. For example, the cost of drilling oil wells, even of the same depth, is quite variable. This variability is due not only to the different types of land but also to the fact that the availability of materials and labor is not the same in every situation. However, fairly accurate estimates can be made of the probable cost of drilling a well of a given depth in a locality where other wells have already been drilled.

A great part of crude oil handled overland is transported through pipe lines to the refineries. The usual pipe sizes are 4, 6, 8, 10, and 12 inches, with pumping stations 12 to 60 miles apart. These lines are often hundreds of miles in length.

One of the principal products obtained by refining petroleum is gasoline. Other petroleum products include naphtha, benzine, kerosene, and various types of lubricating oils.

There are several different methods of refining petroleum. Substantial improvements have been made in these methods during recent years. The improvements nearly all result in a higher recovery of refined products from a given amount of crude oil.

Exercise 9. (*Written*)

1. The Cardinal Oil Company drilled an oil well in which the drilling costs included the following items:

Drilling	$15,000	Day work	$2,600
Casing	7,000	Miscellaneous labor	1,500
Rig	4,200	Other expenses	1,700
Fuel	2,000		

(a) Find the total cost of drilling the well. (b) If the depth of the well was 3,800 feet, find the average cost per foot.

2. The Sunshine Oil Company leased 80 acres of land from Frank Jones. For this lease the company paid Mr. Jones $400 in cash, and agreed to give him as royalty one eighth of the oil obtained. The company drilled a well that produced 28,000 barrels of oil during the first year. The average price of oil that year was $2.65 a barrel. What amount did Mr. Jones receive the first year, including the original cash payment?

3. The Economy Pipe Line Company incurred the following expenses in constructing an 8-inch pipe line 200 miles in length:

Survey and legal expense	$ 30,000
Right of way	40,000
Line pipes	1,500,000
Freight	30,000
Unloading and stringing	100,000
Laying the pipe	150,000
Painting the pipe	17,000
Ditching and covering	175,000
Camp expense	45,000
Tools	20,000
Other expenses	36,000

Find the total expenses per mile.

4. The Tri-State Refining Company separates each barrel of crude oil into the following products:

Gasoline	44%	Kerosene	5%
Fuel Oil	22%	Lubricating oil	4%
Gas oil	17%	Other products and loss	8%

How many barrels of (a) gasoline, (b) fuel oil, and (c) lubricating oil does the refinery produce in refining 18,500 barrels of crude oil?

5. The Sylvan Oil Company obtains 26% lubricating oil from the refining of crude oil. At that rate how many barrels of crude oil must be refined to produce 6,500 barrels of lubricating oil?

6. The United States Bureau of Mines states that recently the annual world production of crude petroleum was determined to be 4,282,977,000 barrels, and of that total, 2,244,529,000 barrels were produced in the United States. The amount produced in the United States in that year was what per cent, to the nearest tenth per cent, of the world production?

7. During a recent year the total production of crude oil in the United States was 2,244,529,000 barrels. Of this amount, Texas produced 1,010,128,000 barrels, California 354,467,000 barrels, Louisiana 231,838,000 barrels, and Oklahoma 187,789,000 barrels. What per cent of the total, to the nearest tenth, was produced by each of the four states?

UNIT XV

WEIGHTS AND MEASURES

Section 1.. Denominate Numbers

Tables of Denominate Numbers. Some of the most commonly used tables of measurement are given below.

LINEAR MEASURE

12 inches (in.) = 1 foot (ft.)
3 feet = 1 yard (yd.)
$5\frac{1}{2}$ yards = 1 rod (rd.)
$16\frac{1}{2}$ feet = 1 rod
320 rods = 1 mile (mi.)
5,280 feet = 1 mile

SQUARE MEASURE

144 sq. in. = 1 sq. ft.
9 sq. ft. = 1 sq. yd.
$30\frac{1}{4}$ sq. yd. = 1 sq. rd.
160 sq. rd. = 1 acre (A)
640 acres = 1 sq. mi. or section
36 sq. mi. = 1 township

CUBIC MEASURE

1,728 cubic inches (cu. in.) = 1 cubic foot (cu. ft.)
27 cubic feet = 1 cubic yard (cu. yd.)
128 cubic feet = 1 cord of wood

DRY MEASURE

2 pints = 1 quart
8 quarts = 1 peck (pk.)
4 pecks = 1 bushel (bu.)

LIQUID MEASURE

4 gills (gi.) = 1 pint (pt.)
2 pints = 1 quart (qt.)
4 quarts = 1 gallon (gal.)

AVOIRDUPOIS WEIGHT

16 ounces = 1 pound (lb.)
100 pounds = 1 hundredweight (cwt.)
2,000 pounds = 1 ton (T)

TIME MEASURE

60 seconds (sec.) = 1 minute (min.)
60 minutes = 1 hour (hr.)
24 hours = 1 day

To Change a Denominate Number to Units of Lower or Higher Denomination. A denominate number is changed to units of lower denomination by multiplication. Thus, 3 ft. = 3 × 12 in. = 36 in. A denominate number is changed to units of higher denomination by division. Thus, 36 in. = 36 ÷ 12 = 3 ft.

Example 1. Change 5 yd. 2 ft. 4 in. to inches.

Solution	*Explanation*
5 × 3 ft. = 15 ft. *15 ft. + 2 ft. = 17 ft.*	Change 5 yd. to 15 ft. and add 2 ft., giving a total of 17 ft.
17 × 12 in. = 204 in. *204 in. + 4 in. = 208 in.*	Change 17 ft. to 204 in. and add 4 in., giving a total of 208 in.
Ans. 208 inches	

Example 2. Change 208 inches to yards, feet, and inches.

Solution	*Explanation*
12) 208 *3) 17 − 4*	Dividing 208 by 12 gives 17 and a remainder of 4. Hence, 208 in. = 17 ft. 4 in.
5 − 2	Dividing 17 by 3 gives 5 and a remainder of 2. Hence, 17 ft. = 5 yd. 2 ft.
Ans. 5 yd. 2 ft. 4 in.	

Exercise 1. (*Written*)

Change each of the following as indicated.

Linear Measure

1. 23 ft. 8 in. to inches
2. 6 yd. 13 in. to inches
3. 163 in. to feet and inches
4. 175 ft. to yards and feet
5. 32 yd. 2 ft. to feet
6. $4\frac{3}{8}$ yd. to inches
7. 3 yd. 1 ft. 7 in. to inches

Square Measure

8. $15\frac{1}{4}$ sq. ft. to square inches
9. $181\frac{1}{2}$ sq. yd. to square feet
10. 350 sq. in. to square feet and square inches

Cubic Measure

11. 8 cu. yd. 15 cu. ft. to cubic feet
12. 320 cu. ft. to cubic yards and cubic feet
13. 252 cu. ft. to cubic yards

Dry Measure

14. 8 bu. 5 qt. to quarts
15. 7 bu. 13 qt. to pints
16. 22 pk. 4 qt. to quarts
17. 4 bu. 3 pk. 5 qt. to quarts

Liquid Measure

18. 8 gal. 3 qt. to quarts
19. 4 gal. 2 qt. 1 pt. to pints
20. 47 pt. to quarts and pints
21. 77 qt. to gallons and quarts

Avoirdupois Weight

22. 14 lb. 10 oz. to ounces
23. 100 oz. to pounds and ounces

Time

24. 3 hr. 27 min. to minutes
25. 204 min. to hours and minutes

Adding and Subtracting Denominate Numbers. The processes of adding and subtracting denominate numbers are illustrated below.

Example 1. Add 3 ft. 8 in.; 2 ft. 10 in.; 5 ft. 9 in.

Solution

3 ft. 8 in.
2 ft. 10 in.
5 ft. 9 in.
10 ft. 27 in., or 12 ft. 3 in.

Ans. 12 ft. 3 in.

Explanation

The sum of the column at the right is 27 in., which equals 2 ft. 3 in. Adding 2 ft. 3 in. to 10 ft. gives 12 ft. 3 in.

Example 2. Subtract 3 hr. 45 min. from 8 hr. 10 min.

Solution

8 hr. 10 min. = 7 hr. 70 min.
3 hr. 45 min. = 3 hr. 45 min.
4 hr. 25 min.

Ans. 4 hr. 25 min.

Explanation

Since 45 min. cannot be subtracted from 10 min., the minuend, 8 hr. 10 min. is changed to 7 hr. 70 min.

Exercise 2. (Written)

1. Add the following:

a. 7 ft. 5 in.; 4 ft. 10 in.; and 8 ft. 5 in.
b. 9 lb. 10 oz.; 7 lb. 13 oz.; and 4 lb. 14 oz.
c. 4 hr. 55 min.; 2 hr. 37 min.; and 3 hr. 52 min.
d. 8 bu. 3 pk.; 3 bu. 2 pk.; and 7 bu. 1 pk.
e. 4 yd. 2 ft. 11 in.; 8 yd. 1 ft. 7 in.; and 6 yd. 10 in.
f. 8 gal. 1 qt. 1 pt.; 9 gal. 3 qt. 1 pt.; and 7 gal. 2 qt. 1 pt.
g. 5 bu. 3 pk. 7 qt.; 6 bu. 2 pk. 5 qt.; and 4 bu. 3 pk. 2 qt.

2. Subtract the following:

a. 8 ft. 5 in.
3 ft. 9 in.

b. 11 ft. 3 in.
4 ft. 10 in.

c. 7 hr. 15 min.
2 hr. 55 min.

d. 9 lb. 7 oz.
5 lb. 12 oz.

e. 9 yd. 1 ft.
4 yd. 2 ft.

f. 12 lb.
3 lb. 7 oz.

g. 12 yd.
4 yd. 2 ft.

h. 8 yd.
3 yd. 1 ft. 7 in.

i. 7 gal. 1 qt.
2 gal. 3 qt. 1 pt.

Multiplying and Dividing Denominate Numbers. The processes of multiplying and dividing denominate numbers are illustrated below.

Example 1. Multiply 3 ft. 7 in. by 4.

Solution

3 ft. 7 in.
4
12 ft. 28 in., or 14 ft. 4 in.

Ans. 14 ft. 4 in.

Explanation

Multiplying 3 ft. 7 in. by 4 gives 12 ft. 28 in. 28 in. equals 2 ft. and 4 in. Adding 2 ft. to 12 ft. gives 14 ft.

Example 2. Divide 14 ft. 5 in. by 4.

Solution

3 ft. 7¼ in.
4)14 ft. 5 in.
12
2 ft. 5 in., or
4) 29 in.
28
1 = ¼
Ans. 3 ft. 7¼ in.

Explanation

Dividing 14 ft. by 4 gives a quotient of 3 ft. and a remainder of 2 ft. Changing 2 ft. 5 in. to inches gives 29 in.

Dividing 29 in. by 4 gives a quotient of 7¼ in.

Exercise 3. (*Written*)

Multiply the following:

1. 7 ft. 8 in. by 9
2. 4 ft. 5 in. by 11
3. 5 gal. 3 qt. by 5
4. 8 gal. 2 pt. by 7
5. 9 lb. 7 oz. by 6
6. 3 lb. 13 oz. by 12
7. 3 hr. 20 min. by 8
8. 4 hr. 55 min. by 5
9. 3 yd. 2 ft. 1 in. by 5
10. 4 yd. 1 ft. 5 in. by 4
11. 4 gal. 3 qt. 1 pt. by 9
12. 2 bu. 3 pk. 5 qt. by 6

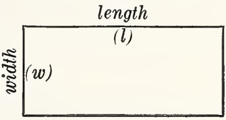
Exercise 4. (*Written*)

Divide each of the following:

1. 28 ft. 10 in. by 2
2. 24 lb. 12 oz. by 4
3. 15 hr. 40 min. by 5
4. 12 ft. 7 in. by 4
5. 36 ft. 3 in. by 5
6. 26 lb. 4 oz. by 6
7. 39 yd. 2 ft. by 7
8. 15 bu. 6 pk. 3 qt. by 3
9. 5 pk. 2 qt. by 3
10. 5 ft. 8 in. by 4
11. 7 yd. 2 ft. 4 in. by 2
12. 5 yd. 3 ft. 6 in. by 4

Section 2 . . . Measurement of Rectangles and Rectangular Solids

To Find the Perimeter of a Rectangle. The *perimeter* of a rectangle is the distance around it, measured along its boundary line. In a rectangle the opposite sides are equal. Hence, the perimeter (P) equals 2 times the length of the rectangle ($2l$) plus 2 times the width ($2w$) and is expressed by the formula:



$$P = 2l + 2w$$

Thus, if a room is 15 ft. long and 12 ft. wide, the perimeter of the floor or ceiling is 54 ft.

$$P = 2l + 2w = (2 \times 15) + (2 \times 12) = 30 + 24 = 54 \text{ ft.}$$

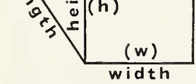
To Find the Area of a Rectangle. The area (A) of a rectangle equals the product of the length times the width ($l \times w$), both measurements being expressed in units of the same denomination. Hence the formula:

$$A = l \times w, \text{ or } A = lw$$

For example, the area of the floor or ceiling of a room 15 ft. long and 12 ft. wide is 180 sq. ft.

$$A = l \times w = 15 \times 12 = 180 \text{ sq. ft.}$$

To Find the Volume of a Rectangular Solid. Any figure having length, width, and height is a solid. A solid figure having six faces, each face being a rectangle, is a *rectangular solid*. The face on which the solid is supposed to rest is called the *base*.



The volume (V) of a rectangular solid equals the length times the width times the height ($l \times w \times h$), all measurements being expressed in the same units of denomination. Expressed as a formula:

$$V = l \times w \times h, \text{ or } V = lwh$$

Thus, the volume of a rectangular solid 8 ft. long, 6 ft. wide, and 2 ft. high is 96 cu. ft.

$$V = l \times w \times h = 8 \times 6 \times 2 = 96 \text{ cu. ft.}$$

The length times the width represents the area of the base. The formula for the volume may therefore be expressed in the form,

$$V = B \times h, \text{ or } V = Bh$$

in which B stands for the area of the base, $l \times w$.

Exercise 5. (Written)

1. A living room is 22′ 8″ long and 14′ 10″ wide. How many feet of picture molding are needed to go around the room just below the ceiling?

2. At $4.50 a square yard, what will be the cost of laying a cement floor in a garage that is 48 ft. long and 21 ft. wide?

3. A room is 18 ft. long and 15 ft. wide. (a) What is the perimeter of the room? (b) What is the total area of the four walls, in square feet, if the room is 8 ft. high? (c) What is the area of the ceiling? (d) What is the combined area of the walls and ceiling? (e) At 95¢ a square yard, what will be the cost of painting the four walls and ceiling, deducting 120 sq. ft. for openings (doors and windows)? (Count a fraction of a square yard as one square yard.)

4. The living room of a home is 18 ft. long and 12 ft. wide. (a) What is the area of the floor of the room? (b) If a rug 9 ft. long by 12 ft. wide is placed on the floor, how many square feet of the floor will remain uncovered?

5. At 35¢ a square foot, what will it cost to lay a cement walk 5 ft. wide around the outside of a rectangular flower plot 45 ft. long and 30 ft. wide?

6. A driveway 48 feet long and 9 feet wide is to be covered with a 3-inch layer of crushed stone. How many cubic yards of crushed stone will be needed?

7. C. L. Rankin wishes to build a bin 10 ft. long and 8 ft. wide that will have a capacity of 500 cu. ft. What must be the height of the bin in feet and inches?

Exercise 6. (Written)

1. A field 30 rods long and 24 rods wide is to be inclosed with a wire fence. (a) What will be the cost of the posts at 60¢ each if they are placed 1 rod apart? (b) What will be the cost of the wire fencing at 24¢ a foot?

2. At $4.75 a gallon, what will be the cost of paint for the four exterior walls of a warehouse 42 ft. long, 30 ft. wide, and 16½ ft.

high if the first coat is estimated to require one gallon to 48 sq. yd. and the second coat one gallon to 72 sq. yd.?

3. Find the cost of plastering the walls and the ceiling of a room 15 ft. long, 12 ft. wide, and 10 ft. high, and $1.85 per square yard. Allow 130 sq. ft. for openings and baseboard.

4. At 45¢ a sq. ft., what will it cost to lay a 5-foot cement sidewalk around the outer edge of a city block that is 400 ft. long and 200 ft. wide?

5. A cellar 32 ft. long and 24 ft. wide is to be excavated 6 ft. deep. (a) How many cubic yards of earth must be removed, computed to the nearest tenth of a cubic yard? (b) Find the cost of excavating at $1.75 per cubic yard.

6. A concrete floor 4 in. thick is to be laid in the cellar of a house 36 feet long and 24 feet wide. How many cubic yards of concrete will be needed?

7. R. B. Smith wishes to build a bin to contain 768 bu. of grain. It is possible to have the bin 8 ft. wide and 15 ft. long. If $1\frac{1}{4}$ cubic feet are required for 1 bushel, what must be the height of the bin in feet?

Exercise 7. (*Written*)

1. It has been decided to paint the four sides of a building 42 ft. wide by 90 ft. long by 32 ft. high two coats. It is estimated that for the first coat one gallon of paint will cover 450 sq. ft. of surface and that for the second coat one gallon will cover 675 sq. ft. Deducting 348 sq. ft. for openings, find how much the paint for the two coats will cost at $5.60 a gallon.

2. What is the difference between the area of a rectangle 10 ft. by 6 ft. and the area of a square having the same perimeter?

3. A man wishes to construct a poultry house 12 feet long in which to keep 20 hens. If each hen requires 4 sq. ft., how wide should he construct the poultry house?

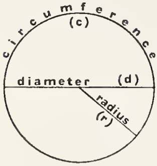
4. If coal can be piled 5 ft. high in a cellar, and there is space for a bin 6 ft. wide, how long should the bin be to provide for 12 tons of coal? (A ton of coal occupies 35 cu. ft.)

5. A man lays a cement walk 4 ft. wide on the side and front of a corner lot 75 ft. front by 100 ft. deep. If he puts the walk on his lot and up to the line, what is the cost at $3.60 per sq. yd.?

6. Find the number of cubic yards of concrete in the foundation walls of a building that is 18′ × 40′, inside measure, if the walls are 9′ high and 18″ thick.

Section 3 . . . Measurement of Circles and Cylinders

The Circle. The distance around a circle is called the *circumference.* The distance across a circle, through the center, is the *diameter.* The distance from the center of a circle to any point on the circumference is the *radius.*



To Find the Circumference of a Circle. The circumference (C) of a circle equals 3.1416 (approximately $3\frac{1}{7}$) times the diameter (d). The factor 3.1416 is denoted by the Greek letter π (pronounced like the word "pie"). Hence the formula:

$$C = \pi d$$

For example, if the diameter of a circle is 20 in., the circumference, to the nearest hundredth of an inch, is 62.83 in., computed as follows:

$$C = \pi d = 3.1416 \times 20 = 62.83 \text{ in.}$$

Since the diameter is twice the length of the radius (r), the formula for the circumference may also be written as:

$$C = 2\pi r$$

If the radius of a circle is 4 in., the circumference, to the nearest hundredth of an inch, is 25.13 in., computed as follows:

$$C = 2\pi r = 2 \times 3.1416 \times 4 = 3.1416 \times 8 = 25.13 \text{ in.}$$

To Find the Area of a Circle. The area of a circle equals π times the square of the radius. The area also equals $\frac{1}{4}$ times π times the square of the diameter. Hence the formula:

$$A = \pi r^2 \quad \text{or} \quad A = \frac{\pi d^2}{4}$$

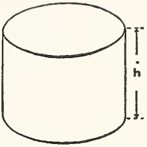
For example, if the *radius* of a circle is 8 ft., the area of the circle, to the nearest tenth of a square foot, is 201.1 sq. ft., computed as follows:

$$A = \pi r^2 = 3.1416 \times 8 \times 8 = 3.1416 \times 64 = 201.1 \text{ sq. ft.}$$

If the *diameter* of a circle is 15 ft., the computation of the area would be:

$$A = \frac{\pi d^2}{4} = \frac{3.1416 \times 15 \times 15}{4} = 176.7 \text{ sq. ft.}$$

The Cylinder. An object such as a water pipe, a stove pipe, or a tomato can has the shape of a *cylinder*. The flat circular ends are called the *bases* of the cylinder. The perpendicular distance between the bases is called the *height* or *altitude*. The curved surface is called the *lateral surface*, and the area of the lateral surface is called the *lateral area.*



To Find the Lateral Area of a Cylinder. The lateral area of a cylinder equals the circumference of the base times the height. If A represents the lateral area, C the circumference of the base, and h the height, the formula is:

$$A = C \times h, \text{ or } A = Ch$$

To Find the Volume of a Cylinder. The volume of a cylinder equals the area of the base times the height. If V represents the volume, B the area of the base, and h the height, the formula for the volume is:

$$V = B \times h, \text{ or } V = Bh$$

Exercise 8. (*Written*)

In each of the following problems use 3.1416 for the value of π.

1. Find to the nearest tenth of an inch the circumference of each of the following circles:

a. Radius, 10 in.
b. Diameter, 18 in.
c. Radius, 22 in.
d. Diameter, 31 in.
e. Radius, 10 ft.
f. Diameter, 12 ft.

2. Find to the nearest hundredth of a foot the circumference of each of the following circles:

a. Radius, 3 ft.
b. Diameter, 2 ft. 9 in.
c. Radius, 4 ft. 8 in.
d. Diameter, 3 ft. 2 in.

3. Find to the nearest square foot the area of each of the following circles:

a. Radius, 20 ft.
b. Diameter, 25 ft.
c. Radius, 6 ft.
d. Diameter, 30 ft.

4. Find to the nearest square foot the lateral area of each of the following cylinders:

a. Radius, 5 ft.; height, 15 ft.
b. Diameter, 9 ft.; height, 12 ft.
c. Radius, 8 ft.; height, 10 ft.
d. Diameter, 30 ft.; height, 30 ft.

5. Find to the nearest cubic foot the volume of each of the following cylinders:

a. Radius, 4 ft.; height, 12 ft.
b. Diameter, 11 ft.; height, 17 ft.
c. Radius, $4\frac{1}{2}$ ft.; height, 18 ft.
d. Diameter, 14 ft.; height, 28 ft.

Exercise 9. (*Written*)

In the following problems, use 3.1416 for the value of π unless otherwise directed.

1. A steel water tank, in the shape of an upright cylinder, has a radius of 10 ft. and is 30 ft. high. What is the area of the curved surface, computed to the nearest square foot?

2. A cylindrical gasoline tank is 8 ft. in diameter and 25 ft. long. What is the total outside area of the tank, in square feet, including the two ends and the lateral surface, computed to the nearest square foot?

3. A silo, in the shape of a cylinder, has an inside diameter of 14 ft. and is 30 ft. high. Find the capacity of the silo in cubic feet, using $3\frac{1}{7}$ for the value of π.

4. A cylindrical gas storage tank has a radius of 25 ft. and is 80 ft. high. (a) How many cubic feet of gas does it contain? (b) At $1.35 a sq. yd., what will it cost to paint the curved surface of the tank? (Count a fraction of a square yard as a whole square yard.)

5. If 1 cu. ft. equals $7\frac{1}{2}$ gallons, find how many gallons of water there are in a cistern which is 12 ft. in diameter, inside measurement, and which is filled to a depth of $10\frac{1}{2}$ ft., using $3\frac{1}{7}$ for the value of π.

6. Find the cost, at $9\frac{1}{2}$ cents a foot, of the woven wire fencing needed to inclose a circular flower bed 30 ft. in diameter, allowing 9 inches for lapping at the end.

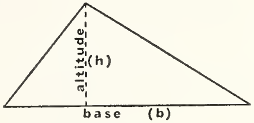
7. Using $3\frac{1}{7}$ for the value of π, find, to the nearest square foot, the area of a circular flower bed 105 feet in diameter.

8. A concrete walk 3 feet wide is to be laid around the outside of a circular flower bed that is 36 feet in diameter. (a) Using $3\frac{1}{7}$ for the value of π, find, to the nearest square foot, the area covered by the walk. (b) Find the cost of laying the walk at 45¢ a square foot.

To find the area of the walk, first find the area of the outer circle, which includes the walk and the flower bed. From that area, subtract the area of the circle representing the flower bed.

Section 4 . . . Measurement of Triangles

The Triangle. A *triangle* is a plane figure having three straight sides. The side on which it is supposed to rest is called the *base.* The point opposite the base is called the *apex.* The perpendicular distance from the apex to the base is called the *altitude.*



To Find the Area of a Triangle. The area of a triangle equals $\frac{1}{2}$ times the base (b) times the altitude (h), and is expressed by the formula:

$$A = \frac{1}{2} \times b \times h, \text{ or } A = \frac{1}{2}bh$$

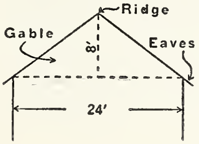
Exercise 10. (*Written*)

1. The base of a triangle is 30 feet and the altitude is 15 feet. What is the area of the triangle?

2. A city lot in the shape of a triangle has a base of 125 feet and an altitude of 110 feet. At $1.60 a square foot, what is the value of the lot?

3. A triangular plot has a base of 70 feet and an altitude of 40 feet. At $1.15 a pound, what will be the cost of grass seed for the plot if 1 lb. is used for each 200 square feet?

4. The sketch at the left shows the gable of a barn, a gable being the vertical triangular portion of the end of a building, from the eaves to the ridge of the roof.



Using the dimensions shown in the sketch, find the area of the gable.

5. Find the cost, at 85¢ a square yard, of painting the two gables of a house 36 ft. wide, the height of the ridge above the eaves being 12 ft.

6. At 55¢ per sq. yd., find the cost of painting the two sides and two ends of a barn 30 ft. wide, 40 ft. long, and 18 ft. high to the eaves, the height of the ridge above the eaves being 15 ft.

7. It has been decided to paint the two sides and two ends of a barn 26 ft. wide, 36 ft. long, and 20 ft. high to the eaves, the height of the ridge above the eaves being 13 ft. It is estimated that for the first coat one gallon of paint will cover 300 square feet of surface and that for the second coat one gallon will cover 450 square feet. Deducting 118 square feet for openings, find how much the paint for two coats will cost at $4.25 a gallon.

Square Root. The square root of a number is one of the two equal factors that produce that number. For example, 4 × 4 equals 16. Therefore, the square root of 16 is 4.

The following illustration shows the process of finding the square root ($\sqrt{}$) of a number.

Example: Find $\sqrt{55696}$

Solution

$$\begin{array}{rl}
 & \sqrt{5'56'96} = 236\ \textit{Ans.} \\
 & \underline{4} \\
3 & \\
40) & 1\,56 \\
 & \underline{1\,29} \\
6 & \\
460) & 27\,96 \\
 & \underline{27\,96}
\end{array}$$

Explanation

(1) Beginning at the units, separate the number into periods of two figures each.

(2) 4 is the largest perfect square in 5, the left-hand period. The square root of 4 is 2. 2 is written at the right as the first figure in the square root or answer. 4 is then written under the 5 and subtracted from it. The remainder is 1.

(3) Bring down the next group, 56. The 2, or the first figure in the root, is doubled. Annex a 0, making 40 for a trial divisor. 40 is contained in 156, 3 times. Adding 3 to the trial divisor makes 43, the complete divisor. Multiplying 43 by 3 gives 129, which is written under 156 and subtracted from it. The remainder is 27. 3 is written as the second figure in the square root.

(4) Bring down the next group, 96. The 23 in the root is doubled. Annex a 0, making 460 for a trial divisor. 460 is contained in 2,796, 6 times. Adding 6 to the trial divisor makes 466, the complete divisor. Mutliplying 466 by 6 gives 2,796, which is written under 2,796. When these numbers are subtracted there is no remainder. 6 is written as the third figure in the square root.

(5) The square root of 55,696 is therefore 236.

Sometimes the complete divisor multiplied by its related number in the root gives a product greater than the remainder from which that product is to be subtracted. When this is the case, the next lower number should be used for the complete divisor and for the number in the root.

For example, the illustration at the top of the next page shows the solution for finding the square root of 729. By studying the solution, you will observe that the first remainder is 329, and the first trial divisor, 40. If 8 is used as the number in the root, the complete divisor becomes 40 + 8, or 48. But 48 multiplied by 8 gives 384, which is greater than 329. Therefore 7, rather than 8, is used for the number in the root and for completing the divisor, giving 40 + 7, or 47, as the complete divisor.

Find $\sqrt{729}$

Solution

$\sqrt{7'29} = 27$
7 $\underline{4}$
$4\cancel{0})$ 329
$\underline{329}$

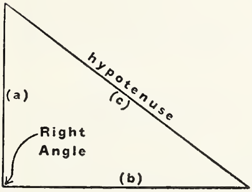
When the square root is to be found of a number containing a decimal, the periods are marked off both to the left and to the right, starting from the decimal point. If there is an odd number of figures at the right of the decimal point, the last period is made complete by annexing a cipher. Thus, to find the square root of 786.294, the separation of the number into periods would be:

7’86.’29’40

Additional pairs of ciphers may be annexed to carry the root to any desired number of decimal places. For example, if it is desired to carry the square root of 786.294 to three decimal places, the separation of the number into periods would be as follows:

7’86.’29’40’00

To Find the Hypotenuse of a Right Triangle. A *right triangle* is a triangle in which one of the angles is a right angle. The side opposite the right angle is called the *hypotenuse* of the triangle.



In every right triangle, the hypotenuse equals the square root of the sum of the squares of the other two sides. If *c* represents the hypotenuse, and *a* and *b* the other two sides, respectively, the formula is:

$$c = \sqrt{a^2 + b^2}$$

Thus, if the other two sides of a triangle measure 9 in. and 12 in., respectively, the length of the hypotenuse is 15 in., computed as follows:

$$\text{Hypotenuse} = \sqrt{9^2 + 12^2} = \sqrt{81 + 144} = \sqrt{225} = 15 \text{ in.}$$

Exercise 11. (*Written*)

1. Find the result of the operation indicated in each of the following:

a. $\sqrt{784}$
b. $\sqrt{7921}$
c. $\sqrt{20164}$
d. $\sqrt{11025}$
e. $\sqrt{441 + 784}$
f. $\sqrt{2025 + 3600}$
g. $\sqrt{1089 + 3136}$
h. $\sqrt{2185 + 2304}$
i. $\sqrt{3}$ to 4th decimal
j. $\sqrt{5.5}$ to 4th decimal
k. $\sqrt{17.8}$ to 3d decimal
l. $\sqrt{134.2}$ to 2d decimal

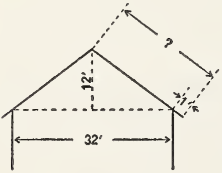
2. Find the hypotenuse of a right triangle having a base of 16 in. and an altitude of 12 in.

3. Find the hypotenuse of a right triangle having a base of 18 ft. and an altitude of 13.5 ft.

4. A baseball diamond is a square 90 feet on a side. Find, correct to the nearest foot, the distance from third base to first base.

5. Find, correct to the nearest tenth of a foot, the diameter of the largest circular mirror that will pass through a doorway 7 feet high and 3 feet wide. (Neglect the thickness of mirror.)

6. The sketch at the left shows the gable of a barn 32 ft. wide, the height of the ridge above the eaves being 12 ft. (a) How wide is each side of the roof if the roof extends 1 ft. beyond the side walls? (b) What is the total area of the roof if the barn is 40 ft. long and the roof extends 1 ft. beyond the end walls?

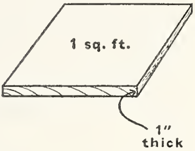


7. How many square feet are there in the roof of a barn 35 ft. long by 28 ft. wide, if the ridge is $10\frac{1}{2}$ ft. higher than the eaves and the roof extends 1 ft. beyond the side walls and 1 ft. beyond the end walls?

8. A barn is 22 feet wide, 30 feet long, and 16 feet high to the eaves, the height of the ridge above the eaves being 10 feet. The roof extends 1 foot beyond the side walls and 1 foot beyond the end walls. (a) Find, to the nearest tenth of a foot, the width of each side of the roof. (b) Find the total area of the roof to the nearest square foot. (c) At $32\frac{1}{2}$¢ a square foot, find the cost of reroofing the barn. (d) At $2.95 a gallon, find the cost of the paint required for painting the two sides and ends of the barn two coats, with 84 square feet deducted for openings, if the first coat is estimated to require one gallon for each 300 square feet and the second coat, one gallon for each 450 square feet.

Section 5 . . . Measurement of Lumber

Board Measure. Lumber is sold by the *board foot* (bd. ft.), which is the quantity of lumber in a board 1 ft. long, 1 ft. wide, and 1 in. thick. In other words, a board foot is the equivalent of a board whose face covers an area of 1 sq. ft. and which is 1 in. thick.



Hence, if the face of a board covers an area of 8 sq. ft., for example, and the board is 1 in. thick, the board contains 8 bd. ft. If it were 2 in. thick, instead of 1 in., it would contain 2× 8, or 16 bd. ft.

To Find the Number of Board Feet in a Quantity of Lumber. The number of board feet in a piece of lumber equals the area of the face in square feet multiplied by the thickness in inches. Since the area of the face is the length times the width, both measured in feet, the formula for the number of board feet in a piece of lumber is:

Number of Bd. Ft. = Length in Feet × Width in Feet × Thickness in Inches

If there are several pieces of the same dimensions, multiply also by the number of pieces to find the total board feet.

Thus, 5 pieces of lumber, each 16 ft. long, 8 in. wide, and 4 in. thick, contain 214 bd. ft., computed as follows:

$$5 \times 16 \times \frac{8}{12} \times 4 = 5 \times 16 \times \frac{8}{\underset{3}{\cancel{12}}} \times \cancel{4} = \frac{640}{3} = 213\tfrac{1}{3}, \text{ or } 214 \text{ bd. ft.}$$

In measuring lumber, a fraction of a board foot is counted as one board foot.

Exercise 12. (*Written*)

1. How many board feet are there in a piece of lumber 22 ft. long, 8 in. wide, and 4 in. thick?

2. Determine the number of feet board measure in 14 pieces of lumber, each piece being 20 ft. long by 10 in. wide by 2 in. thick.

3. A farmer buys 45 pieces of lumber, each piece being 8 ft. long by 4 in. wide by 4 in. thick, to use for posts in building a barbed-wire fence. How many board feet does he buy?

4. Find the total number of board feet in the following bill of lumber:

15 pc. 2″ × 4″ × 18′
8 pc. 3″ × 8″ × 24′

In billing lumber, the number of pieces is given first, then the thickness of each piece, then the width, and then the length. Thus, *15 pc. 2″ × 4″ × 18′* means 15 pieces of lumber, each piece being 2 in. thick by 4 in. wide by 18 ft. long.

5. Find the total number of board feet in the following:

32 pc. 4″ × 6″ × 10′
45 pc. 2″ × 6″ × 16′
70 pc. 2″ × 4″ × 14′
65 pc. $\frac{7}{8}$″ × 8″ × 16′

In each line of work in the foregoing list, count a fraction of a board foot as one board foot.

A board less than 1″ thick is treated as though it were 1″ thick.

6. The price of lumber is usually quoted by the thousand (M) feet board measure. Find the total cost of the following:

4,230 ft. b.m. hemlock @ $108 per M.
12,643 ft. b.m. fir @ $122 per M.
5,987 ft. b.m. pine @ $148 per M.

7. Find the total cost of the following bill of lumber:

64 pc. 3″ × 12″ × 18′ @ $125 per M
115 pc. 2″ × 12″ × 16′ @ $120 per M
88 pc. 2″ × 10″ × 14′ @ $115 per M
243 pc. 2″ × 4″ × 10′ @ $108 per M

8. At $118 per M, find the total cost of the following bill of lumber:

112 pieces 2″ × 6″ × 18′
48 " 6″ × 8″ × 16′
24 " 2″ × 10″ × 18′
60 " 2″ × 4″ × 14′
90 " $\frac{3}{4}$″ × 8″ × 16′

9. A porch is 7′ wide by $10\frac{1}{2}$′ long. How many pieces of flooring 14′ long by $3\frac{1}{2}$″ wide are needed to cover the porch?

10. A 6-foot tight board fence 32 feet long is to be built with 6-inch unmatched boards nailed vertically on two lines of stringers made of 2″ × 4″ nailed to posts set 8 feet apart. Find (a) the number of posts required, (b) the number of 16-foot stringers, 2″ × 4″, required, and (c) the number of 12-foot boards, 1″ × 6″, required.

DRILLS FOR ACCURACY AND SPEED

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Drill 1. Basic Combinations in Addition (*Oral*)

Practice the following combinations until you can read the sum of each at a glance. Copy the combinations on a piece of paper, and hand the paper to someone to check you as you give the results aloud.

	a	*b*	*c*	*d*	*e*	*f*	*g*	*h*	*i*	*j*	*k*	*l*	*m*	*n*	*o*
1.	9 6	5 5	7 9	8 1	9 5	8 9	6 5	2 5	6 9	3 6	2 3	2 8	6 3	7 4	3 9
2.	9 7	2 9	6 2	6 4	7 8	3 5	7 5	8 8	3 7	6 1	4 8	4 1	5 9	2 4	9 8
3.	7 1	7 6	2 2	8 4	7 3	6 5	9 4	4 5	9 3	2 1	3 4	9 1	8 6	3 3	5 7
4.	6 8	9 2	2 6	1 9	5 8	4 4	8 2	9 9	8 3	1 4	5 3	1 5	4 6	2 7	4 9
5.	6 7	1 6	7 7	1 2	4 7	1 3	7 2	4 2	3 8	4 3	5 6	8 7	6 6	5 4	3 2

Drill 2. Addition (*Oral*)

With a little practice you should be able to read the sum of each of the following combinations instantly. Follow the same practice directions as were given for Drill 1.

	a	*b*	*c*	*d*	*e*	*f*	*g*	*h*	*i*
1.	19 6	65 5	9 87	5 29	98 9	5 58	76 9	8 42	97 4
2.	86 4	8 37	8 58	97 5	9 41	34 8	95 9	8 49	37 6
3.	4 49	7 77	69 1	48 6	7 85	53 8	2 59	93 7	55 8
4.	6 34	9 64	58 2	3 79	64 7	56 8	95 6	7 68	6 36
5.	33 9	69 7	9 52	4 88	27 3	5 86	36 7	69 9	3 48

Drill 3. Using Combinations in Addition (*Oral*)

In adding columns of figures, you can increase your speed by combining two or more figures mentally and adding them to the others in one amount.

The method of combining the figures is shown in the illustration below at the left. The figures that are combined are indicated by the brackets. In adding the column from the bottom up, you should think "12, 20, 30, 39." In checking the final sum by adding from the top down, you should think "9, 19, 27, 39."

Add orally, from the bottom up, the columns of figures given below, using groups of two figures. Repeat the drill, adding the columns from the top down.

$$\begin{array}{l} \left.\begin{array}{l}5\\4\end{array}\right\}9 \\ \left.\begin{array}{l}3\\7\end{array}\right\}10 \\ \left.\begin{array}{l}4\\4\end{array}\right\}8 \\ \left.\begin{array}{l}9\\3\end{array}\right\}12 \\ \hline 39 \end{array}$$

a	*b*	*c*	*d*	*e*	*f*	*g*	*h*	*i*	*j*
7	5	4	5	4	5	3	7	2	7
2	2	3	4	5	5	4	6	8	7
4	1	2	2	3	6	5	9	9	2
6	4	4	8	1	7	8	3	5	9
2	8	7	1	6	8	4	4	7	2
6	2	3	9	4	6	4	6	1	5
6	2	6	2	5	9	3	3	3	8
1	2	5	1	7	4	7	2	5	1

Drill 4. Using Combinations in Addition (*Mental*)

Place a sheet of paper under the columns given below. Add from the bottom up, using groups of two figures where possible, and write the sum on the sheet of paper. Prove each sum by adding from the top down.

a	*b*	*c*	*d*	*e*	*f*	*g*	*h*	*i*	*j*	*k*	*l*
3	4	2	1	6	5	4	7	3	2	8	9
1	8	2	4	3	3	6	8	7	3	2	9
5	1	9	6	9	6	2	3	8	3	6	7
5	3	7	7	1	9	3	5	1	1	7	3
1	7	4	5	8	6	2	2	6	9	8	5
3	5	2	4	5	4	6	8	8	6	1	6
2	4	8	2	4	9	7	6	2	8	9	4
3	8	6	1	4	5	8	6	5	7	7	7
6	1	3	3	7	3	5	1	9	3	5	9

Drill 5. Addition (Mental)

In the problems given below, the horizontal rows of addends are numbered as indicated at the left.

Place a sheet of paper across the page so that the upper edge of the paper is under the sixth addend of each column. Then add each column of exposed numbers from the bottom up, using combinations wherever possible, and write the sum on the sheet of paper. Repeat the drill, adding the columns from the top down.

Proceed in a similar manner with the edge of a piece of paper placed under the seventh row of addends, then under the eighth row, and so on, as directed by your teacher.

	a	*b*	*c*	*d*	*e*	*f*
1.	76	89	86	456	$ .86	$129.35
2.	94	76	679	5,794	.29	87.29
3.	81	21	48	76,532	.31	3.50
4.	27	48	63	967	.42	16.48
5.	43	37	99	87,658	12.95	194.76
6.	59	52	75	4,369	.87	8.95
7.	84	19	32	2,123	.64	69.83
8.	26	87	21	35,254	.72	100.00
9.	29	31	198	4,683	.27	7.26
10.	74	55	54	28,765	1.46	35.42
11.	83	83	37	5,124	.35	472.19
12.	19	49	89	71,676	.92	107.24
13.	79	23	75	3,782	.88	86.28
14.	85	53	42	52,497	.83	55.24
15.	92	18	783	870	5.47	423.42
16.	81	72	77	4,746	.35	82.50
17.	27	25	65	87,323	.47	641.99
18.	14	31	82	195	.57	74.50
19.	36	66	76	15,621	.67	82.67
20.	48	74	18	434	.24	121.15

Daily practice on the foregoing drill will help you to acquire added speed and accuracy in addition. By adding six addends of each column the first day, seven addends the second day, eight the third day, and so on, you will soon be able to add long columns of figures quickly and accurately.

Drill 6. Subtraction (*Oral*)

With practice you can learn to subtract as rapidly as you can read combinations in addition. Practice on the following oral problems until you can read the remainders at a glance.

	a	*b*	*c*	*d*	*e*	*f*	*g*	*h*	*i*	*j*	*k*
1.	11 4	8 7	9 3	16 9	14 8	10 1	16 6	3 2	12 5	9 7	14 6
2.	5 3	11 2	10 9	9 5	7 6	13 4	9 8	8 2	14 5	10 8	19 9
3.	12 3	16 7	8 1	12 4	4 1	18 9	10 2	11 3	7 5	18 8	13 6
4.	4 3	10 7	11 9	2 1	9 2	14 4	11 6	14 7	9 4	15 8	10 5
5.	15 9	12 7	10 4	17 8	15 6	11 8	13 5	12 9	15 7	16 8	14 9
6.	25 6	70 5	96 9	34 5	77 9	63 5	85 9	50 8	71 4	42 9	76 7
7.	61 9	45 8	66 8	72 5	50 9	42 8	61 2	57 8	43 6	92 4	91 5
8.	53 4	84 7	70 1	54 6	92 7	61 8	36 9	80 7	63 8	43 7	28 9
9.	41 3	40 6	73 9	32 3	51 7	74 8	81 6	35 7	42 6	36 9	96 7

Drill 7. Subtraction (*Mental*)

Place a sheet of paper under the columns in Problem 1, above; subtract, and write the remainders on this sheet. Write the answers as rapidly as you can, but write them legibly.

Do the same with Problems 2 to 9, inclusive.

Drill 8. Subtraction (Mental)

Place a sheet of paper across the page so that the upper edge of the paper is under the subtrahends of the first horizontal row of problems given below. Then subtract and write the remainders on the sheet of paper. Prove the result in each case by adding the remainder to the subtrahend.

Do the same with Problems 2 to 6.

	a	*b*	*c*	*d*
1.	8,965,395 7,360,273	$57,630.00 40,534.75	12,806,638 9,707,553	$877,151.58 480,561.92
2.	9,789,489 5,608,029	$76,700.00 39,410.12	91,313,904 35,296,808	$120,121.17 20,250.89
3.	8,437,482 1,105,381	$374,422.08 268,370.09	82,104,006 64,008,009	$105,074.27 99,257.35
4.	9,491,459 2,441,251	$200,907.00 107,358.81	95,016,102 89,067,304	$121,025.19 96,865.37
5.	8,618,790 3,204,202	$860,131.15 267,490.08	13,601,111 8,643,514	$121,001.02 74,627.06
6.	3,656,000 1,023,061	$101,060.01 48,990.68	17,482,562 8,489,768	$910,101.01 500,699.17

Drill 9. Multiplication of Whole Numbers (Written)

Perform the indicated multiplication in each of the following problems and prove the result.

1. 268 × 341
2. 722 × 307
3. 623 × 504
4. 431 × 208
5. 822 × 702
6. 3,206 × 2,105
7. 4,013 × 3,402
8. 5,204 × 4,021
9. 6,051 × 5,014
10. 7,003 × 1,008
11. 5,009 × 3,007
12. 6,008 × 4,002
13. 7,102 × 6,004
14. 6,203 × 5,006
15. 4,022 × 2,009

Drill 10. Multiplication Involving Decimals (*Written*)

Perform the indicated multiplication in each of the following problems and prove the result.

1. 74.1 × 82
2. 6.32 × 44
3. 4.08 × 67
4. 6.42 × 25.4
5. 8.07 × 4.23
6. 54.3 × 6.04
7. 20.7 × 8.05
8. .316 × .112
9. .045 × 3.08
10. 3.61 × 5.04
11. 71.1 × 30.8
12. .406 × .205
13. 72.9 × .0301
14. 81.5 × .0142
15. .725 × .35
16. .376 × .012
17. 4.09 × 3.007
18. 90.1 × .0805
19. 4.63 × .107
20. .347 × .026
21. 1.202 × .208
22. .4127 × 1.001
23. .3413 × 3.008
24. .8614 × .402
25. .0965 × .91
26. 600.9 × 8.7
27. 71.02 × 3.05

Drill 11. Multiplication Involving End Ciphers (*Written*)

Perform the indicated multiplication in each of the following problems and prove the result.

1. 264 × 3,800
2. 314 × 1,300
3. 232 × 4,100
4. 422 × 2,300
5. 280 × 76
6. 190 × 44
7. 340 × 63
8. 420 × 38
9. 440 × 2,200
10. 230 × 1,700
11. 510 × 3,300
12. 420 × 5,300
13. 94,000 × 570
14. 24,000 × 360
15. 52,000 × 180
16. 31,000 × 420
17. 24.5 × 2,700
18. 4.12 × 350
19. 30.4 × 4,100
20. 4.01 × 3,030
21. 930 × 3.75
22. 1,700 × 4.06
23. 6.50 × 1,700
24. 8.20 × 1,400
25. 12.10 × 1,600
26. 19,000 × 3.50
27. 2,310 × 4.10
28. 7,200 × 5.50
29. 6.40 × 2,300
30. 4.20 × 3,800

Drill 12. Multiplication Involving Dollars and Cents (*Written*)

Perform the indicated multiplication in each of the following and prove the result.

1. $8.50 × 45
2. $9.40 × 350
3. $6.50 × 1,300
4. $1.90 × 1,450
5. $ .70 × 1,750
6. $9.75 × 2,200
7. $ .45 × 180
8. $ .52 × 2,100
9. $ .34 × 14,000
10. $ 1.02 × 10,500
11. $10.50 × 3,040
12. $ 4.05 × 4,080
13. $ 8,500 × .02542
14. $12,400 × .10205
15. $16,700 × .035
16. $34,000 × .01912
17. $65,000 × .00915
18. $20,500 × .0304

Drill 13. Division with Whole Numbers (Written)

Perform the indicated division in each of the following and prove the quotient.

1. 1,134 ÷ 27
2. 1,504 ÷ 32
3. 2,294 ÷ 37
4. 1,739 ÷ 37
5. 7,392 ÷ 84
6. 5,488 ÷ 56
7. 6,322 ÷ 58
8. 9,729 ÷ 47
9. 11,778 ÷ 39
10. 25,920 ÷ 64
11. 46,816 ÷ 77
12. 25,664 ÷ 16
13. 94,094 ÷ 143
14. 10,032 ÷ 114
15. 10,912 ÷ 176
16. 22,016 ÷ 128
17. 48,222 ÷ 171
18. 49,344 ÷ 257

Drill 14. Division Involving Decimals (Written)

In each of the following problems, divide correct to the number of decimal places indicated and prove the quotient.

To 1 decimal place

1. 500 ÷ 2.2
2. 15 ÷ 6.3
3. 84.8 ÷ 1.15
4. 57.1 ÷ .09
5. 70.7 ÷ .87
6. 1.58 ÷ .542
7. 8.5 ÷ .061
8. 82.25 ÷ 25.4

To 2 decimal places

9. 70 ÷ 13.2
10. 1.02 ÷ 5.4
11. 13.3 ÷ 8.4
12. 6.6 ÷ .37
13. 2.19 ÷ .079
14. 3.454 ÷ 2.4
15. 2.085 ÷ 2.6
16. 8.002 ÷ .78

To 3 decimal places

17. 7.66 ÷ 2.6
18. .892 ÷ 3.9
19. 2 ÷ 5.7
20. 1.52 ÷ .54
21. .776 ÷ .69
22. 4.01 ÷ 2.6
23. .484 ÷ .56
24. 13.3 ÷ 6.92

Drill 15. Division Involving End Ciphers in the Divisor (Written)

In each of the following problems, divide correct to the number of decimal places indicated and prove the quotient.

To 1 decimal place

1. 3,815 ÷ 180
2. 2,855 ÷ 490
3. 8,325 ÷ 2,600
4. 4,800 ÷ 4,400
5. 965.5 ÷ 350
6. 18,950 ÷ 7,300

To 2 decimal places

7. 2,000 ÷ 4,700
8. 824.5 ÷ 3,500
9. 460 ÷ 280
10. 25.9 ÷ 730
11. 6,450 ÷ 12,100
12. 6,500 ÷ 170

To 3 decimal places

13. 330 ÷ 7,900
14. 21.85 ÷ 1,500
15. 17,150 ÷ 17,000
16. 200 ÷ 6,700
17. 422 ÷ 5,300
18. 1,390 ÷ 1,350

Drill 16. Addition of Fractions and Mixed Numbers (Written)

Find the sum of each of the following.

1.	2.	3.	4.	5.	6.
$8\frac{1}{3}$	$8\frac{1}{12}$	$15\frac{5}{6}$	$12\frac{1}{6}$	$8\frac{3}{4}$	$\frac{3}{4}$
$14\frac{1}{6}$	$\frac{5}{6}$	$11\frac{3}{8}$	$13\frac{1}{8}$	$12\frac{1}{3}$	$17\frac{2}{3}$
$12\frac{2}{3}$	$10\frac{3}{4}$	$\frac{1}{2}$	$\frac{1}{4}$	$8\frac{3}{8}$	$11\frac{5}{6}$
$\frac{3}{4}$	$9\frac{2}{3}$	$8\frac{3}{4}$	$9\frac{1}{2}$	$\frac{1}{2}$	$3\frac{2}{3}$

7.	8.	9.	10.	11.	12.
$6\frac{7}{8}$	$6\frac{3}{5}$	$11\frac{1}{4}$	$2\frac{3}{4}$	$13\frac{2}{3}$	$8\frac{4}{5}$
$7\frac{7}{12}$	$8\frac{1}{4}$	$9\frac{1}{2}$	$21\frac{5}{16}$	$12\frac{1}{2}$	$9\frac{8}{15}$
$9\frac{2}{3}$	$12\frac{2}{3}$	$10\frac{1}{6}$	$17\frac{3}{8}$	$16\frac{7}{12}$	$20\frac{7}{10}$
$18\frac{3}{4}$	$9\frac{1}{2}$	$3\frac{3}{8}$	$12\frac{1}{2}$	$14\frac{3}{4}$	$13\frac{1}{2}$
$8\frac{1}{6}$	$5\frac{7}{10}$	$4\frac{2}{3}$	$8\frac{7}{8}$	$11\frac{5}{6}$	$8\frac{1}{3}$

13.	14.	15.	16.	17.	18.
$13\frac{3}{4}$	$5\frac{11}{16}$	$21\frac{1}{4}$	$9\frac{1}{6}$	$16\frac{3}{4}$	$21\frac{1}{3}$
$8\frac{4}{5}$	$9\frac{7}{8}$	$19\frac{2}{3}$	$11\frac{1}{4}$	$18\frac{1}{2}$	$14\frac{2}{9}$
$14\frac{1}{2}$	$12\frac{3}{4}$	$17\frac{5}{6}$	$22\frac{3}{8}$	$21\frac{5}{6}$	$7\frac{5}{6}$
$12\frac{3}{10}$	$14\frac{1}{2}$	$35\frac{1}{2}$	$15\frac{2}{3}$	$13\frac{7}{8}$	$9\frac{3}{4}$
$8\frac{3}{4}$	$10\frac{13}{16}$	$9\frac{7}{8}$	$16\frac{5}{6}$	$8\frac{2}{3}$	$22\frac{1}{2}$

19.	20.	21.	22.	23.	24.
$9\frac{3}{5}$	$2\frac{3}{4}$	$14\frac{5}{6}$	$4\frac{3}{8}$	$16\frac{4}{5}$	$21\frac{2}{9}$
$7\frac{1}{2}$	$8\frac{5}{6}$	$8\frac{2}{3}$	$15\frac{3}{4}$	$8\frac{7}{15}$	$14\frac{5}{6}$
$11\frac{1}{3}$	$12\frac{3}{8}$	$9\frac{3}{4}$	$16\frac{17}{24}$	$4\frac{3}{10}$	$11\frac{2}{3}$
$8\frac{3}{4}$	$15\frac{2}{3}$	$11\frac{5}{12}$	$3\frac{3}{16}$	$13\frac{1}{2}$	$17\frac{5}{12}$
$10\frac{9}{10}$	$13\frac{1}{2}$	$6\frac{3}{8}$	$7\frac{2}{3}$	$10\frac{11}{30}$	$6\frac{1}{2}$

Drill 17. Subtraction of Fractions and Mixed Numbers (Written)

Perform the subtraction in each of the following.

1.	2.	3.	4.	5.	6.
$18\frac{7}{12}$	$16\frac{9}{10}$	$27\frac{7}{15}$	$16\frac{1}{2}$	$21\frac{3}{4}$	$19\frac{5}{6}$
$7\frac{1}{2}$	$\frac{3}{5}$	$9\frac{1}{3}$	$\frac{1}{3}$	$6\frac{2}{3}$	$8\frac{3}{4}$

7.	8.	9.	10.	11.	12.
$24\frac{11}{12}$	$10\frac{7}{15}$	$21\frac{3}{4}$	$10\frac{3}{8}$	$12\frac{3}{4}$	$18\frac{1}{3}$
$\frac{5}{8}$	$2\frac{3}{10}$	$\frac{4}{5}$	$2\frac{2}{3}$	$\frac{7}{8}$	$4\frac{1}{2}$

13.	14.	15.	16.	17.	18.
$12\frac{1}{2}$	$13\frac{1}{4}$	$10\frac{2}{3}$	$14\frac{1}{2}$	$15\frac{1}{2}$	$28\frac{2}{3}$
$8\frac{7}{8}$	$\frac{7}{8}$	$3\frac{3}{5}$	$5\frac{5}{8}$	$9\frac{4}{5}$	$5\frac{3}{8}$

19.	20.	21.	22.	23.	24.
$13\frac{1}{4}$	$27\frac{2}{3}$	$19\frac{5}{8}$	$12\frac{1}{6}$	$22\frac{3}{10}$	$37\frac{5}{8}$
$6\frac{3}{8}$	$2\frac{5}{6}$	$3\frac{3}{4}$	$7\frac{1}{2}$	$2\frac{4}{5}$	$3\frac{4}{5}$

Drill 18. Multiplication of Fractions and Mixed Numbers (Written)

Find the product in each of the following.

1. $12\frac{1}{2}$ $16\frac{1}{4}$	2. $14\frac{1}{3}$ $15\frac{1}{2}$	3. $12\frac{2}{3}$ $9\frac{1}{4}$	4. $16\frac{1}{2}$ $5\frac{1}{4}$	5. $12\frac{1}{3}$ $8\frac{1}{2}$	6. $15\frac{1}{4}$ $9\frac{2}{3}$
7. $27\frac{1}{2}$ $22\frac{2}{3}$	8. $21\frac{2}{3}$ $12\frac{1}{3}$	9. $32\frac{1}{4}$ $8\frac{3}{4}$	10. $27\frac{1}{2}$ $15\frac{2}{3}$	11. $21\frac{2}{3}$ $10\frac{1}{3}$	12. $32\frac{1}{4}$ $7\frac{3}{4}$
13. $20\frac{3}{4}$ $9\frac{1}{2}$	14. $15\frac{3}{4}$ $20\frac{2}{3}$	15. $18\frac{1}{4}$ $16\frac{2}{3}$	16. $12\frac{1}{4}$ $13\frac{2}{3}$	17. $16\frac{3}{4}$ $7\frac{1}{2}$	18. $21\frac{3}{4}$ $9\frac{2}{3}$
19. $36\frac{3}{8}$ $24\frac{1}{3}$	20. $32\frac{2}{3}$ $15\frac{1}{8}$	21. $27\frac{3}{4}$ $20\frac{1}{3}$	22. $25\frac{3}{8}$ $16\frac{1}{3}$	23. $18\frac{2}{3}$ $12\frac{1}{8}$	24. $17\frac{3}{4}$ $24\frac{1}{3}$
25. $34\frac{3}{8}$ 12	26. $12\frac{5}{6}$ 13	27. 18 $14\frac{3}{8}$	28. $18\frac{2}{3}$ $\frac{3}{4}$	29. $14\frac{3}{8}$ $\frac{2}{3}$	30. $21\frac{3}{4}$ $\frac{2}{5}$
31. $24\frac{3}{8}$ 26	32. $34\frac{2}{5}$ $15\frac{2}{3}$	33. $21\frac{3}{4}$ $10\frac{1}{5}$	34. $29\frac{3}{8}$ $15\frac{1}{5}$	35. $22\frac{3}{4}$ $18\frac{1}{3}$	36. $42\frac{1}{7}$ $36\frac{2}{3}$

Drill 19. Division of Fractions and Mixed Numbers (Written)

Perform the indicated division in each of the following.

1. $47 \div \frac{2}{3}$
2. $28 \div \frac{3}{4}$
3. $42 \div \frac{4}{5}$
4. $92 \div \frac{8}{9}$
5. $39 \div \frac{5}{6}$
6. $31\frac{1}{3} \div 4$
7. $52\frac{1}{2} \div 6$
8. $45\frac{1}{3} \div 8$
9. $69\frac{3}{4} \div 9$
10. $124\frac{1}{2} \div 12$
11. $35 \div 4\frac{2}{3}$
12. $117 \div 6\frac{3}{4}$
13. $270 \div 9\frac{3}{8}$
14. $140 \div 11\frac{1}{4}$
15. $126 \div 13\frac{1}{2}$
16. $153 \div 15\frac{3}{4}$
17. $29\frac{3}{8} \div 3\frac{1}{8}$
18. $126\frac{2}{3} \div 13\frac{1}{3}$
19. $86\frac{1}{4} \div 18\frac{3}{4}$
20. $204\frac{1}{6} \div 29\frac{1}{6}$
21. $81\frac{1}{4} \div 43\frac{3}{4}$
22. $56\frac{7}{8} \div 16\frac{1}{4}$
23. $45\frac{5}{6} \div 18\frac{1}{3}$
24. $44\frac{1}{4} \div 29\frac{1}{2}$
25. $58\frac{11}{12} \div 25\frac{1}{4}$
26. $70\frac{5}{16} \div 18\frac{3}{4}$
27. $35\frac{8}{15} \div 16\frac{2}{5}$
28. $40\frac{5}{8} \div 12\frac{3}{16}$
29. $48\frac{3}{4} \div 7\frac{7}{8}$
30. $37\frac{1}{8} \div 16\frac{1}{2}$
31. $154\frac{1}{6} \div 24\frac{2}{3}$
32. $58\frac{1}{3} \div 12\frac{1}{2}$
33. $46\frac{2}{3} \div 17\frac{1}{2}$
34. $151\frac{2}{3} \div 16\frac{1}{4}$
35. $95\frac{1}{4} \div 21\frac{1}{6}$
36. $43\frac{1}{8} \div 19\frac{1}{6}$

Drill 20. Multiplication by 10, 100, and 1,000 (Mental)

Perform the indicated multiplication in each of the following.

1. 7.38 × 10
2. 9.21 × 100
3. 4.72 × 1,000
4. 6.3 × 100
5. 3.27 × 10
6. .596 × 1,000
7. 9.85 × 100
8. 5.345 × 10
9. 5.63 × 10
10. 4.2 × 100
11. 3.4 × 1,000
12. 42.7 × 10
13. .085 × 100
14. .071 × 10
15. 4.98 × 1,000
16. 5.08 × 100
17. 9.76 × 10
18. .021 × 1,000

Drill 21. Division by 10, 100, and 1,000 (Mental)

Perform the indicated division in each of the following.

1. 348 ÷ 10
2. 1,987 ÷ 1,000
3. 847 ÷ 100
4. 7,240 ÷ 1,000
5. 360 ÷ 10
6. 93.4 ÷ 10
7. 73.8 ÷ 10
8. 9.2 ÷ 100
9. 4.7 ÷ 1,000
10. 5.63 ÷ 100
11. 7.2 ÷ 10
12. 20 ÷ 1,000
13. 7.3 ÷ 100
14. 9.16 ÷ 10
15. 5.9 ÷ 1,000
16. 80 ÷ 100
17. 7.8 ÷ 10
18. 30 ÷ 1,000

Drill 22. Multiplication and Division by 10, 100, and 1,000 (Mental)

Perform the operation indicated in each of the following.

1. 7.38 × 10
2. .042 × 1,000
3. 348 ÷ 10
4. 420 ÷ 1,000
5. 9.20 × 100
6. .38 × 10
7. 198 ÷ 1,000
8. .38 ÷ 10
9. 6.47 × 1,000
10. 6.9 ÷ 100
11. .74 ÷ 1,000
12. 56.3 × 100
13. 64.7 ÷ 1,000
14. .069 × 100
15. .38 × 10
16. .21 ÷ 100
17. 5.63 ÷ 100
18. .0074 × 1,000

Drill 23. Multiplication by .1, .01, and .001 (Mental)

Perform the indicated multiplication in each of the following.

1. 73.8 × .1
2. 9.2 × .01
3. 647 × .001
4. 34.1 × .01
5. 5.31 × .1
6. 362 × .001
7. 83.4 × .1
8. 3.85 × .01
9. 53.4 × .1
10. 863 × .1
11. 4.22 × .01
12. 713 × .001
13. 62.4 × .1
14. 3,420 × .001
15. 4.8 × .01
16. .68 × .001
17. 72 × .001
18. 408 × .01

Drill 24. Division by .1, .01, and .001 (Mental)

Perform the indicated division in each of the following.

1. 73.8 ÷ .1
2. 8.2 ÷ .01
3. 46.7 ÷ .001
4. 21.4 ÷ .01
5. 3.61 ÷ .1
6. .485 ÷ .001
7. 72.36 ÷ .1
8. 2.74 ÷ .01
9. 6.456 ÷ .1
10. 5.74 ÷ .1
11. 4.33 ÷ .01
12. 6.54 ÷ .001
13. 33.6 ÷ .1
14. .706 ÷ .001
15. .263 ÷ .01
16. 7.69 ÷ .1
17. 3.872 ÷ .001
18. 6.70 ÷ .01
19. 1.43 ÷ .1
20. .021 ÷ .001
21. 4.3 ÷ .01

Drill 25. Multiplication and Division by .1, .01, and .001 (Mental)

Perform the indicated operation in each of the following.

1. 6.31 ÷ .1
2. .042 ÷ .001
3. 348 × .1
4. 420 × .001
5. 9.20 ÷ .01
6. .27 ÷ .1
7. 183 × .001
8. .52 × .1
9. 3.25 ÷ .001
10. 7.4 × .01
11. .95 × .001
12. 62.5 ÷ .01
13. 8.5 × .001
14. .012 ÷ .01
15. .27 ÷ .1
16. .19 × .01
17. 7.25 × .01
18. .0065 ÷ .001
19. 3.75 × .1
20. 4.25 ÷ .1
21. 8.4 × .001

Drill 26. Multiplication and Division by 10, 100, and 1,000; and .1, .01, and .001 (Mental)

Perform the indicated operation in each of the following.

1. 2.6 ÷ 100
2. .086 ÷ .01
3. 9.7 × 10
4. .325 ÷ .001
5. .55 × 1,000
6. 7.15 × .01
7. 4.72 ÷ 10
8. 6.5 ÷ .1
9. 3.4 ÷ 10
10. 27.8 ÷ 10
11. 6.1 ÷ .01
12. .021 × 100
13. .275 ÷ .01
14. 4.2 × 100
15. .45 × .001
16. .073 × 10
17. 2.6 × 100
18. .02 ÷ 10
19. 4.4 × .1
20. 4.32 × 1,000
21. 52.4 ÷ 10
22. .084 × .01
23. 3.6 ÷ 100
24. .002 × 10
25. .84 ÷ .001
26. .012 × .1
27. .045 × 10
28. 1.27 ÷ .1
29. 3.25 × .001
30. 9.6 × 1,000
31. .75 ÷ 10
32. 8.7 ÷ 100
33. .006 × .1
34. 42.7 × 10
35. 6.5 × 100
36. 3.6 ÷ 10

Drill 27. Articles Purchased in Quantities of 10, 100, or 1,000 (Mental)

Find the cost of each of the following.

1. 10 @ $.16
2. 100 @ $.18
3. 1,000 @ $.12
4. 10 @ $.02½
5. 10 @ $.07½
6. 10 @ $.12½
7. 100 @ $.02½
8. 100 @ $.01¼
9. 100 @ $.06¼
10. 1,000 @ $.02½
11. 1,000 @ $.01¼
12. 1,000 @ $.06¼
13. 100 @ $.33⅓
14. 100 @ $.83⅓
15. 100 @ $.66⅔
16. 100 @ $.16⅔
17. 10 @ $.33⅓
18. 10 @ $.83⅓
19. 10 @ $.16⅔
20. 10 @ $.66⅔
21. 1,000 @ $.33⅓
22. 1,000 @ $.66⅔
23. 1,000 @ $.16⅔
24. 10 @ $.01¼
25. 10 @ $.06¼
26. 10 @ $.03¾
27. 10 @ $.08¾
28. 10 @ $.03⅓
29. 10 @ $.08⅓
30. 10 @ $.01⅔

Drill 28. Articles Priced at 10¢, $1, $10, etc. (Mental)

Find the cost of each of the following.

1. 65 @ 10¢
2. 32 @ $1
3. 17 @ $10
4. 2½ @ $1
5. 37½ @ $10
6. 7½ @ $100
7. 1¼ @ $100
8. 6¼ @ $100
9. 3¾ @ $100
10. 8¾ @ $100
11. 1¼ @ $10
12. 6¼ @ $10
13. 3¾ @ $10
14. 8¾ @ $10
15. 33⅓ @ $1
16. 3⅓ @ $1
17. 66⅔ @ $1
18. 1⅔ @ $1
19. 3⅓ @ $10
20. 6⅔ @ $10
21. 16⅔ @ $10
22. 1¼ @ 10¢
23. 6¼ @ 10¢
24. 3¾ @ 10¢
25. 8¾ @ 10¢
26. 3⅓ @ 10¢
27. 8⅓ @ 10¢
28. 1⅔ @ 10¢
29. 6⅔ @ 10¢
30. 2½ @ 10¢

Drill 29. Articles Priced per C, Cwt., M, or T (Mental)

Find the cost of each of the following.

1. 125 cans @ $6 per C.
2. 750 articles @ $4 per C.
3. 175 articles @ $12 per C.
4. 350 articles @ $1.20 per C.
5. 250 pounds @ $8 per cwt.
6. 175 pounds @ $12 per cwt.
7. 150 pounds @ $3.60 per cwt.
8. 75 pounds @ $4.40 per cwt.
9. 1,500 articles @ $8.50 per M.
10. 1,750 articles @ $12 per M.
11. 1,250 articles @ $24 per M.
12. 1,400 articles @ $15 per M.
13. 1,200 articles @ $6.50 per M.
14. 3,200 articles @ $25 per M.
15. 2,500 articles @ $84 per M.
16. 2,500 pounds @ $18 per T.
17. 1,500 pounds @ $24 per T.
18. 500 pounds @ $14 per T.
19. 250 pounds @ $96 per T.
20. 200 pounds @ $15 per T.
21. 750 pounds @ $12 per T.
22. 3,500 pounds @ $16 per T.

Drill 30. Addition and Subtraction of Fractions (Mental)

Perform the operation indicated in each of the following.

1. $\frac{1}{4} + \frac{3}{16}$
2. $\frac{1}{3} + \frac{5}{6}$
3. $\frac{1}{6} + \frac{11}{12}$
4. $\frac{1}{8} + \frac{15}{16}$
5. $\frac{7}{8} + \frac{1}{16}$
6. $\frac{5}{6} + \frac{7}{12}$
7. $\frac{1}{4} + \frac{5}{12}$
8. $\frac{1}{6} + \frac{7}{12}$
9. $\frac{1}{3} + \frac{11}{12}$
10. $\frac{3}{4} + \frac{7}{12}$
11. $\frac{5}{6} + \frac{11}{12}$
12. $\frac{1}{2} + \frac{2}{3}$
13. $\frac{5}{6} + \frac{1}{8}$
14. $\frac{2}{3} + \frac{3}{4}$
15. $\frac{3}{4} + \frac{1}{6}$
16. $\frac{2}{3} + \frac{1}{5}$
17. $\frac{4}{5} + \frac{1}{2}$
18. $\frac{5}{6} + \frac{3}{4}$
19. $\frac{3}{8} + \frac{2}{3}$
20. $\frac{2}{3} + \frac{2}{5}$
21. $\frac{5}{8} - \frac{3}{16}$
22. $\frac{2}{3} - \frac{1}{6}$
23. $\frac{11}{12} - \frac{1}{4}$
24. $\frac{5}{6} - \frac{1}{3}$
25. $\frac{7}{12} - \frac{1}{4}$
26. $\frac{2}{3} - \frac{1}{5}$
27. $\frac{3}{4} - \frac{1}{6}$
28. $\frac{11}{12} - \frac{3}{4}$
29. $\frac{3}{4} - \frac{7}{12}$
30. $\frac{5}{6} - \frac{3}{4}$
31. $\frac{1}{4} + \frac{1}{8} + \frac{1}{2}$
32. $\frac{1}{3} + \frac{1}{6} + \frac{1}{2}$
33. $\frac{1}{4} + \frac{3}{8} + \frac{1}{2}$
34. $\frac{7}{8} + \frac{1}{2} + \frac{3}{4}$
35. $\frac{1}{3} + \frac{1}{2} + \frac{5}{6}$
36. $\frac{1}{2} + \frac{1}{4} + \frac{5}{8}$
37. $\frac{1}{2} + \frac{5}{8} + \frac{3}{4}$
38. $\frac{1}{4} + \frac{1}{2} + \frac{7}{8}$
39. $\frac{3}{4} + \frac{3}{8} + \frac{1}{2}$
40. $\frac{1}{8} + \frac{1}{2} + \frac{3}{4}$

Drill 31. Multiplication and Division of Fractions (Mental)

Perform the operation indicated in each of the following.

1. $\frac{1}{3} \times \frac{2}{3}$
2. $\frac{1}{2} \times \frac{1}{3}$
3. $\frac{1}{4}$ of $\frac{4}{5}$
4. $\frac{1}{3} \times \frac{3}{8}$
5. $\frac{1}{2}$ of $\frac{4}{5}$
6. $\frac{1}{3}$ of $\frac{15}{16}$
7. $\frac{1}{4}$ of $\frac{8}{9}$
8. $\frac{2}{3}$ of $\frac{6}{7}$
9. $\frac{3}{5} \times \frac{15}{16}$
10. $\frac{3}{4}$ of $\frac{12}{25}$
11. $\frac{2}{3}$ of $\frac{9}{25}$
12. $\frac{2}{3} \times \frac{3}{8}$
13. $\frac{2}{5}$ of $\frac{15}{16}$
14. $\frac{3}{4} \times \frac{8}{15}$
15. $\frac{3}{5}$ of $\frac{15}{16}$
16. $\frac{5}{6}$ of $\frac{12}{25}$
17. $\frac{4}{5}$ of $\frac{15}{32}$
18. $\frac{3}{4} \times \frac{6}{7}$
19. $\frac{5}{6} \times \frac{4}{9}$
20. $\frac{3}{8}$ of $\frac{6}{25}$
21. $\frac{1}{3} \div \frac{1}{2}$
22. $\frac{3}{8} \div \frac{2}{3}$
23. $\frac{1}{6} \div \frac{1}{4}$
24. $\frac{3}{8} \div \frac{5}{8}$
25. $\frac{2}{5} \div \frac{4}{5}$
26. $\frac{1}{9} \div \frac{2}{3}$
27. $\frac{1}{2} \div \frac{5}{6}$
28. $\frac{2}{9} \div \frac{1}{3}$
29. $\frac{1}{2} \div \frac{3}{4}$
30. $\frac{5}{8} \div \frac{3}{4}$
31. $\frac{3}{8} \div \frac{1}{2}$
32. $\frac{4}{15} \div \frac{2}{3}$
33. $\frac{3}{5} \div \frac{9}{10}$
34. $\frac{2}{3} \div \frac{8}{9}$
35. $\frac{1}{2} \div \frac{1}{3}$
36. $\frac{1}{3} \div \frac{1}{4}$
37. $\frac{3}{4} \div \frac{3}{5}$
38. $\frac{3}{4} \div \frac{2}{3}$
39. $\frac{2}{3} \div \frac{3}{8}$
40. $\frac{1}{4} \div \frac{1}{6}$
41. $\frac{3}{4} \div \frac{3}{10}$
42. $\frac{2}{3} \div \frac{1}{3}$
43. $\frac{9}{10} \div \frac{3}{10}$
44. $\frac{5}{8} \div \frac{3}{8}$
45. $\frac{2}{3} \div \frac{2}{9}$
46. $\frac{3}{4} \div \frac{5}{8}$
47. $\frac{3}{4} \div \frac{1}{2}$
48. $\frac{2}{5} \div \frac{3}{15}$
49. $\frac{8}{9} \div \frac{2}{3}$
50. $\frac{9}{10} \div \frac{3}{5}$

Drill 32. Review of Fractions (Mental)

Perform the operation indicated in each of the following.

1. $\frac{7}{8} - \frac{1}{4}$
2. $\frac{1}{4} \div \frac{1}{3}$
3. $\frac{1}{2} \times \frac{6}{7}$
4. $\frac{4}{5} + \frac{7}{10}$
5. $\frac{3}{5} \div \frac{3}{4}$
6. $\frac{5}{12} - \frac{1}{3}$
7. $\frac{2}{3} + \frac{1}{4}$
8. $\frac{3}{5}$ of $\frac{15}{32}$
9. $\frac{3}{4} \div \frac{5}{6}$
10. $\frac{2}{5} + \frac{3}{4}$
11. $\frac{3}{4} \times \frac{16}{25}$
12. $\frac{5}{6} - \frac{1}{12}$
13. $\frac{2}{5} + \frac{5}{6}$
14. $\frac{5}{9} \div \frac{7}{9}$
15. $\frac{1}{2} - \frac{3}{16}$
16. $\frac{2}{3}$ of $\frac{9}{16}$
17. $\frac{3}{10} \div \frac{9}{10}$
18. $\frac{5}{12} - \frac{1}{6}$
19. $\frac{2}{5}$ of $\frac{15}{32}$
20. $\frac{2}{9} \div \frac{2}{3}$
21. $\frac{3}{4} - \frac{5}{12}$
22. $\frac{4}{5} \div \frac{3}{5}$
23. $\frac{3}{4} + \frac{1}{6}$
24. $\frac{3}{15} \div \frac{2}{5}$
25. $\frac{5}{6} \times \frac{4}{7}$
26. $\frac{2}{3} - \frac{1}{4}$
27. $\frac{7}{9} \div \frac{2}{3}$
28. $\frac{3}{5} - \frac{1}{4}$
29. $\frac{2}{3} \div \frac{8}{9}$
30. $\frac{1}{8} + \frac{5}{12}$
31. $\frac{3}{4} + \frac{1}{8} + \frac{1}{2}$
32. $\frac{1}{4} + \frac{7}{8} + \frac{1}{2}$
33. $\frac{5}{6} + \frac{1}{2} + \frac{2}{3}$
34. $\frac{3}{4} + \frac{1}{2} + \frac{3}{8}$
35. $\frac{1}{2} + \frac{1}{6} + \frac{2}{3}$
36. $\frac{1}{3} \times \frac{3}{4} \times \frac{4}{5}$
37. $\frac{2}{3} \times \frac{3}{8} \times \frac{1}{2}$
38. $\frac{5}{6} \times \frac{2}{3} \times \frac{2}{5}$
39. $\frac{3}{4} \times \frac{2}{3} \times \frac{6}{7}$
40. $\frac{2}{3} \times \frac{7}{8} \times \frac{4}{5}$

Drill 33. Conversion of Decimals to Per Cents (Mental)

Find the per cent equivalent to each of the following.

1. .25
2. .37
3. .123
4. .03
5. .004
6. .0035
7. 1.25
8. 2.45
9. 3
10. 2
11. .425
12. .0075
13. 1½
14. 1⅓
15. .20
16. .0625
17. 1¾
18. 1⅔
19. .001
20. 1.5

Drill 34. Conversion of Per Cents to Decimals (Mental)

Find the decimal or whole number equivalent to each of the following.

1. 75%
2. 46%
3. 3.5%
4. .2%
5. 175%
6. 225%
7. 300%
8. 4%
9. 1%
10. ½%
11. ¼%
12. ⅔%
13. 200%
14. ¾%
15. 100%
16. .15%
17. ⅖%
18. ⅛%
19. .125%
20. ⅓%

Drill 35. Conversion of Per Cents to Fractions (Mental)

Find the fraction equivalent to each of the following.

1. 17%
2. 3%
3. 2.3%
4. 1.9%
5. 6%
6. 14%
7. 8%
8. 12%
9. 1.3%
10. 1.4%
11. .8%
12. .5%
13. 1.5%
14. 5%
15. 4%
16. 35%
17. 24%
18. 2.8%
19. 1.2%
20. 34%

Drill 36. Multiplication by Aliquot Parts of 100% (Mental)

Perform the indicated multiplication in each of the following.

1. 12½% of $32
2. 50% of $37
3. 83⅓% of $42
4. 66⅔% of $33
5. 87½% of $48
6. 37½% of $64
7. 75% of $28
8. 25% of $96
9. 16⅔% of $54
10. 62½% of $96
11. 33⅓% of $36
12. 87½% of $72
13. 62½% of $40
14. 33⅓% of $129
15. 16⅔% of $78
16. 66⅔% of $45
17. 25% of $29
18. 50% of $49
19. 16⅔% of $40
20. 25% of $22
21. 25% of $26
22. 12½% of $65
23. 25% of $29
24. 50% of $43
25. 16⅔% of $39
26. 12½% of $50
27. 33⅓% of $40
28. 75% of $13
29. 37½% of $50
30. 66⅔% of $20

Drill 37. Multiplication by 1%, 10%, etc. (*Mental*)

Perform the indicated multiplication in each of the following.

1. 1% of $40
2. 10% of $82
3. 100% of $39
4. 1,000% of $32
5. 10% of $24
6. 1% of $76
7. 1,000% of $4.50
8. 10% of $112
9. 1% of $120
10. 10% of $65
11. 1% of $125
12. 1,000% of $2.15
13. 100% of $78
14. 1% of $150
15. 10% of $125
16. 100% of $1.67
17. 1,000% of $.56
18. 1% of $6.95
19. 100% of $35.40
20. 10% of $8.17
21. 1% of $35.40
22. 1,000% of $4.60
23. 10% of $8.75
24. 1% of $124.30

Drill 38. Multiplication of a Per Cent by 1, 10, 100, etc. (*Mental*)

Perform the indicated multiplication in each of the following.

1. 25% of $1
2. 66⅔% of $10
3. 62½% of $100
4. 83⅓% of $1,000
5. 75% of $100
6. 37½% of $10
7. 16⅔% of $1,000
8. 87½% of $1,000
9. 1% of $100
10. 87½% of $1
11. 75% of $10
12. 16⅔% of $100
13. 12½% of $10
14. 83⅓% of $100
15. 33⅓% of $10
16. 62½% of $1,000
17. 66⅔% of $1
18. 25% of $10
19. 75% of $1,000
20. 1½% of $100
21. 1¼% of $1,000
22. 7½% of $10
23. 6¼% of $100
24. 3¾% of $1,000

Drill 39. Multiplication by Fractional Parts of 1% (*Mental*)

Perform the indicated multiplication in each of the following.

1. 1% of $700
2. ½% of $600
3. ¼% of $800
4. ⅓% of $1,200
5. ⅕% of $1,000
6. ⅛% of $2,400
7. ⅒% of $1,000
8. ¾% of $800
9. ⅔% of $600
10. ⅜% of $2,400
11. 1% of $525
12. ⅔% of $1,500
13. ½% of $1,250
14. ¾% of $600
15. ⅜% of $1,200
16. ⅒% of $1,575
17. ⅔% of $480
18. ⅜% of $96
19. ¾% of $560
20. ½% of $100
21. ⅒% of $1,828
22. ½% of $735
23. ⅔% of $100
24. ¾% of $520
25. ⅒% of $14.72
26. ⅜% of $400
27. ¾% of $100
28. ⅒% of $1,216
29. ⅔% of $500
30. ½% of $845

Drill 40. Aliquot Parts—¼, ½, and ¾ of 10¢, $1, etc. (Mental)

Find the cost of each of the following.

1. 48 @ $25
2. 240 @ 25¢
3. 44 @ $2.50
4. 12 @ $250
5. 360 @ 2½¢
6. 28 @ $50
7. 65 @ 50¢
8. 124 @ $5
9. 27 @ $500
10. 1,500 @ 5¢
11. 36 @ $75
12. 880 @ 7½¢
13. 32 @ $7.50
14. 160 @ 75¢
15. 24 @ $750

Drill 41. Aliquot Parts—Review (Mental)

Find the cost of each of the following.

1. 36 @ $250
2. 44 @ 75¢
3. 48 @ $2.50
4. 124 @ 2½¢
5. 48 @ $75
6. 72 @ 25¢
7. 260 @ $5
8. 120 @ 7½¢
9. 28 @ $750
10. 128 @ $25
11. 240 @ $7.50
12. 364 @ 25¢
13. 204 @ 7½¢
14. 32 @ $75
15. 76 @ $2.50
16. 56 @ 75¢
17. 52 @ 2½¢
18. 56 @ $2.50

Drill 42. Aliquot Parts—⅛ of 10¢, $1, etc. (Mental)

Find the cost of each of the following.

1. 72 @ 12½¢
2. 32 @ $12.50
3. 56 @ $1.25
4. 96 @ 1¼¢
5. 16 @ $125
6. 40 @ $12.50
7. 88 @ 12½¢
8. 24 @ $125
9. 104 @ 1¼¢
10. 64 @ $1.25
11. 128 @ 12½¢
12. 168 @ $12.50

Drill 43. Aliquot Parts—Cumulative Review (Mental)

Find the cost of each of the following.

1. 72 @ $1.25
2. 48 @ $7.50
3. 480 @ 1¼¢
4. 56 @ $25
5. 24 @ $750
6. 32 @ $125
7. 92 @ 5¢
8. 64 @ $12.50
9. 60 @ 7½¢
10. 76 @ 25¢
11. 96 @ 12½¢
12. 36 @ $75
13. 16 @ $125
14. 248 @ 2½¢
15. 49 @ 50¢
16. 408 @ 1¼¢
17. 68 @ $2.50
18. 160 @ $1.25
19. 64 @ 75¢
20. 28 @ $250
21. 560 @ 12½¢
22. 284 @ $2.50
23. 120 @ $12.50
24. 48 @ $7.50

Drill 44. Aliquot Parts—$\frac{3}{8}$ of 10¢, $1, etc. (*Mental*)

Find the cost of each of the following.

1. 72 @ $37\frac{1}{2}$¢
2. 48 @ $3.75
3. 32 @ $3\frac{3}{4}$¢
4. 24 @ $37.50
5. 16 @ $375
6. 64 @ $3\frac{3}{4}$¢
7. 56 @ $3.75
8. 88 @ $37\frac{1}{2}$¢
9. 32 @ $37.50
10. 96 @ $37\frac{1}{2}$¢
11. 64 @ $3.75
12. 168 @ $3\frac{3}{4}$¢

Drill 45. Aliquot Parts—Cumulative Review (*Mental*)

Find the cost of each of the following.

1. 36 @ 25¢
2. 16 @ $75
3. 88 @ $37\frac{1}{2}$¢
4. 160 @ $7\frac{1}{2}$¢
5. 240 @ $3\frac{3}{4}$¢
6. 64 @ 75¢
7. 48 @ $37.50
8. 72 @ $12\frac{1}{2}$¢
9. 24 @ $250
10. 64 @ $3.75
11. 96 @ $1\frac{1}{4}$¢
12. 28 @ $25
13. 32 @ $750
14. 52 @ $2.50
15. 56 @ $125
16. 84 @ $7.50
17. 164 @ $2\frac{1}{2}$¢
18. 48 @ $12.50
19. 24 @ $375
20. 96 @ $1.25
21. 144 @ $2\frac{1}{2}$¢

Drill 46. Aliquot Parts—$\frac{5}{8}$ of 10¢, $1, etc. (*Mental*)

Find the cost of each of the following.

1. 64 @ $62\frac{1}{2}$¢
2. 32 @ $62.50
3. 48 @ $6\frac{1}{4}$¢
4. 16 @ $625
5. 64 @ $6.25
6. 48 @ $62.50
7. 96 @ $62\frac{1}{2}$¢
8. 24 @ $625
9. 160 @ $6\frac{1}{4}$¢
10. 72 @ $6.25
11. 168 @ $62\frac{1}{2}$¢
12. 56 @ $62.50

Drill 47. Aliquot Parts—Cumulative Review (*Mental*)

Find the cost of each of the following.

1. 84 @ 75¢
2. 16 @ $375
3. 36 @ $7.50
4. 72 @ $6\frac{1}{4}$¢
5. 44 @ $75
6. 64 @ $62\frac{1}{2}$¢
7. 12 @ $750
8. 128 @ $1\frac{1}{4}$¢
9. 88 @ $62.50
10. 176 @ $12\frac{1}{2}$¢
11. 288 @ $2\frac{1}{2}$¢
12. 32 @ $125
13. 28 @ $250
14. 56 @ $6.25
15. 72 @ $1.25
16. 68 @ $2.50
17. 24 @ $375
18. 216 @ 25¢
19. 240 @ $3\frac{3}{4}$¢
20. 96 @ $25
21. 32 @ $3.75
22. 64 @ $7\frac{1}{2}$¢
23. 24 @ $12.50
24. 32 @ $37.50

Drill 48. Aliquot Parts—$\frac{7}{8}$ of 10¢, \$1, etc. (Mental)

Find the cost of each of the following.

1. 64 @ $87\frac{1}{2}$¢
2. 16 @ \$87.50
3. 48 @ \$8.75
4. 56 @ $8\frac{3}{4}$¢
5. 24 @ \$875
6. 56 @ \$8.75
7. 72 @ $87\frac{1}{2}$¢
8. 16 @ \$875
9. 96 @ $8\frac{3}{4}$¢
10. 64 @ \$8.75
11. 240 @ $87\frac{1}{2}$¢
12. 32 @ \$87.50

Drill 49. Aliquot Parts—Cumulative Review (Mental)

Find the cost of each of the following.

1. 96 @ $12\frac{1}{2}$¢
2. 64 @ \$8.75
3. 72 @ $3\frac{3}{4}$¢
4. 68 @ \$2.50
5. 88 @ \$6.25
6. 96 @ \$1.25
7. 24 @ \$62.50
8. 48 @ $37\frac{1}{2}$¢
9. 36 @ \$75
10. 120 @ 25¢
11. 32 @ $8\frac{3}{4}$¢
12. 16 @ \$3.75
13. 144 @ $1\frac{1}{4}$¢
14. 48 @ $87\frac{1}{2}$¢
15. 24 @ \$37.50
16. 36 @ \$25
17. 72 @ $6\frac{1}{4}$¢
18. 64 @ $7\frac{1}{2}$¢
19. 48 @ \$87.50
20. 120 @ $62\frac{1}{2}$¢
21. 96 @ \$12.50
22. 88 @ 75¢
23. 32 @ \$875
24. 424 @ $2\frac{1}{2}$¢

Drill 50. Aliquot Parts—$\frac{1}{3}$, $\frac{2}{3}$, $\frac{1}{6}$, and $\frac{5}{6}$ of 10¢ and \$1 (Mental)

Find the cost of each of the following.

1. 36 @ $3\frac{1}{3}$¢
2. 42 @ $6\frac{2}{3}$¢
3. 18 @ $8\frac{1}{3}$¢
4. 66 @ $1\frac{2}{3}$¢
5. 45 @ $33\frac{1}{3}$¢
6. 90 @ $66\frac{2}{3}$¢
7. 72 @ $16\frac{2}{3}$¢
8. 48 @ $83\frac{1}{3}$¢
9. 27 @ $33\frac{1}{3}$¢
10. 18 @ $6\frac{2}{3}$¢
11. 126 @ $16\frac{2}{3}$¢
12. 96 @ $3\frac{1}{3}$¢
13. 42 @ $8\frac{1}{3}$¢
14. 240 @ $1\frac{2}{3}$¢
15. 48 @ $66\frac{2}{3}$¢
16. 36 @ $83\frac{1}{3}$¢
17. 66 @ $6\frac{2}{3}$¢
18. 54 @ $8\frac{1}{3}$¢

Drill 51. Aliquot Parts—$\frac{1}{12}$, $\frac{1}{15}$, and $\frac{1}{16}$ of \$1 (Mental)

Find the cost of each of the following.

1. 32 @ $6\frac{1}{4}$¢
2. 45 @ $6\frac{2}{3}$¢
3. 84 @ $8\frac{1}{3}$¢
4. 75 @ $6\frac{2}{3}$¢
5. 96 @ $8\frac{1}{3}$¢
6. 48 @ $6\frac{1}{4}$¢
7. 120 @ $6\frac{2}{3}$¢
8. 72 @ $8\frac{1}{3}$¢
9. 64 @ $6\frac{1}{4}$¢
10. 288 @ $8\frac{1}{3}$¢
11. 96 @ $6\frac{1}{4}$¢
12. 150 @ $6\frac{2}{3}$¢

Drill 52. Aliquot Parts—Cumulative Review (Mental)

Find the cost of each of the following.

1. 96 @ 62$\frac{1}{2}$¢
2. 72 @ 33$\frac{1}{3}$¢
3. 64 @ 7$\frac{1}{2}$¢
4. 72 @ $3.75
5. 180 @ 1$\frac{2}{3}$¢
6. 22 @ 25¢
7. 128 @ $12.50
8. 120 @ 87$\frac{1}{2}$¢
9. 45 @ 6$\frac{2}{3}$¢
10. 328 @ 1$\frac{1}{4}$¢
11. 64 @ $6.25
12. 39 @ 6$\frac{2}{3}$¢
13. 21 @ 75¢
14. 48 @ $37.50
15. 96 @ 16$\frac{2}{3}$¢
16. 18 @ $2.50
17. 64 @ 3$\frac{3}{4}$¢
18. 72 @ $8.75
19. 144 @ 8$\frac{1}{3}$¢
20. 104 @ 12$\frac{1}{2}$¢
21. 56 @ $62.50
22. 42 @ 66$\frac{2}{3}$¢
23. 36 @ $7.50
24. 72 @ 6$\frac{1}{4}$¢
25. 96 @ 3$\frac{1}{3}$¢
26. 26 @ $25
27. 88 @ 37$\frac{1}{2}$¢
28. 64 @ $87.50
29. 124 @ 2$\frac{1}{2}$¢
30. 36 @ $1.25
31. 120 @ 8$\frac{3}{4}$¢
32. 64 @ 6$\frac{1}{4}$¢
33. 52 @ $75

Drill 53. Combinations of Aliquot Parts of 10¢ and $1 (Mental)

Find the cost of each of the following.

1. 32 @ 1.12\frac{1}{2}$
2. 26 @ $1.50
3. 44 @ 12$\frac{1}{2}$¢
4. 18 @ 1.33\frac{1}{3}$
5. 12 @ $1.75
6. 36 @ $1.25
7. 24 @ 1.87\frac{1}{2}$
8. 32 @ 1.62\frac{1}{2}$
9. 40 @ 1.37\frac{1}{2}$
10. 52 @ 12$\frac{1}{2}$¢
11. 34 @ 15¢
12. 16 @ $1.75
13. 64 @ 1.37\frac{1}{2}$
14. 72 @ 1.12\frac{1}{2}$
15. 32 @ 1.87\frac{1}{2}$
16. 17 @ $1.50
17. 124 @ $1.25
18. 28 @ 12$\frac{1}{2}$¢
19. 16 @ 1.62\frac{1}{2}$
20. 27 @ 1.33\frac{1}{3}$
21. 25 @ 15¢
22. 360 @ 12$\frac{1}{2}$¢
23. 40 @ 1.87\frac{1}{2}$
24. 84 @ $1.25

Drill 54. Aliquot Parts—$\frac{1}{4}$, $\frac{1}{2}$, and $\frac{3}{4}$ of 10, 100, etc. (Mental)

Find the cost of each of the following.

1. 25 @ $24
2. 750 @ $12
3. 7$\frac{1}{2}$ @ $36
4. 50 @ $19
5. 250 @ $16
6. 2$\frac{1}{2}$ @ $28
7. 75 @ $36
8. 500 @ 27¢
9. 250 @ 24¢
10. 75 @ 36¢
11. 5 @ $1.40
12. 750 @ 16¢
13. 25 @ $1.08
14. 7$\frac{1}{2}$ @ 64¢
15. 50 @ $.40$\frac{1}{2}$
16. 2$\frac{1}{2}$ @ 96¢
17. 25 @ $26
18. 7$\frac{1}{2}$ @ 88¢
19. 250 @ 32¢
20. 75 @ 44¢
21. 500 @ 37¢
22. 2$\frac{1}{2}$ @ $1.40
23. 750 @ 24¢
24. 25 @ $18

Drill 55. Aliquot Parts—⅛ and ⅜ of 10, 100, etc. (*Mental*)

Find the cost of each of the following.

1. 12½ @ $24
2. 375 @ $16
3. 3¾ @ $48
4. 125 @ $9.60
5. 1¼ @ $6.40
6. 37½ @ 88¢
7. 125 @ $5.60
8. 1¼ @ $3.20
9. 37½ @ 72¢
10. 3¾ @ $2.40
11. 12½ @ $1.04
12. 375 @ 16¢

Drill 56. Review of Aliquot Parts of 10, 100, and 1,000 (*Mental*)

Find the cost of each of the following.

1. 25 @ $2.16
2. 1¼ @ $1.68
3. 375 @ 24¢
4. 75 @ 84¢
5. 3¾ @ $48
6. 250 @ 36¢
7. 12½ @ $3.20
8. 2½ @ $9.60
9. 750 @ 16¢
10. 37½ @ 48¢
11. 7½ @ $2.80
12. 125 @ $7.20
13. 75 @ 84¢
14. 375 @ 32¢
15. 1¼ @ $1.60
16. 25 @ $45
17. 125 @ 56¢
18. 7½ @ $1.60

Drill 57. Aliquot Parts—⅝ and ⅞ of 10, 100, etc. (*Mental*)

Find the cost of each of the following.

1. 62½ @ 96¢
2. 875 @ 24¢
3. 8¾ @ $1.60
4. 625 @ 32¢
5. 87½ @ $4.80
6. 6¼ @ $24
7. 875 @ 16¢
8. 62½ @ 72¢
9. 6¼ @ $5.60
10. 8¾ @ $32
11. 625 @ 88¢
12. 87½ @ $2.40

Drill 58. Review of Aliquot Parts of 10, 100, etc. (*Mental*)

Find the cost of each of the following.

1. 25 @ $36
2. 625 @ 88¢
3. 3¾ @ 64¢
4. 75 @ $3.20
5. 875 @ 48¢
6. 6¼ @ $2.40
7. 12½ @ $12.80
8. 250 @ $28
9. 8¾ @ $16
10. 37½ @ $1.60
11. 750 @ 44¢
12. 2½ @ $56
13. 62½ @ $3.20
14. 125 @ 16¢
15. 7½ @ $2.40
16. 87½ @ $24
17. 375 @ 32¢
18. 1¼ @ $1.68
19. 25 @ $12.40
20. 50 @ $1.68
21. 875 @ 32¢
22. 125 @ $2.40
23. 2½ @ $5.60
24. 375 @ 72¢
25. 37½ @ $4.80
26. 250 @ 64¢
27. 62½ @ $24
28. 7½ @ $8.40
29. 625 @ 96¢
30. 75 @ $3.60

Drill 59. Aliquot Parts—$\frac{1}{3}$, $\frac{2}{3}$, $\frac{1}{6}$ and $\frac{5}{6}$ of 10 and 100 (Mental)

Find the cost of each of the following.

1. $33\frac{1}{3}$ @ 27¢
2. $8\frac{1}{3}$ @ 36¢
3. $66\frac{2}{3}$ @ 15¢
4. $3\frac{1}{3}$ @ 45¢
5. $1\frac{2}{3}$ @ 42¢
6. $83\frac{1}{3}$ @ 36¢
7. $6\frac{2}{3}$ @ 24¢
8. $16\frac{2}{3}$ @ 72¢
9. $66\frac{2}{3}$ @ $1.20
10. $8\frac{1}{3}$ @ $4.20
11. $33\frac{1}{3}$ @ $1.08
12. $1\frac{2}{3}$ @ 96¢
13. $3\frac{1}{3}$ @ $2.10
14. $16\frac{2}{3}$ @ $1.80
15. $6\frac{2}{3}$ @ $18
16. $83\frac{1}{3}$ @ 54¢
17. $66\frac{2}{3}$ @ 69¢
18. $1\frac{2}{3}$ @ $6.60

Drill 60. Review of Aliquot Parts of 10, 100, etc. (Mental)

Find the cost of each of the following.

1. $12\frac{1}{2}$ @ $2.48
2. $6\frac{2}{3}$ @ $21
3. $1\frac{1}{4}$ @ $1.44
4. $33\frac{1}{3}$ @ 27¢
5. 750 @ 28¢
6. $3\frac{1}{3}$ @ $1.80
7. 75 @ $5.60
8. 875 @ $3.20
9. $7\frac{1}{2}$ @ $48
10. $87\frac{1}{2}$ @ $64
11. 250 @ 24¢
12. $8\frac{3}{4}$ @ $1.60
13. 25 @ $26
14. 625 @ 16¢
15. $2\frac{1}{2}$ @ $68
16. 50 @ $2.70
17. $6\frac{1}{4}$ @ $32
18. $83\frac{1}{3}$ @ $1.80
19. 375 @ $2.40
20. $16\frac{2}{3}$ @ $3.60
21. $3\frac{3}{4}$ @ $168
22. $8\frac{1}{3}$ @ $66
23. 125 @ 56¢
24. $62\frac{1}{2}$ @ $4.80
25. $66\frac{2}{3}$ @ $39
26. $37\frac{1}{2}$ @ $3.20
27. $1\frac{2}{3}$ @ $27
28. 25 @ $41
29. $12\frac{1}{2}$ @ $4.80
30. $16\frac{2}{3}$ @ 78¢
31. 50 @ $40\frac{1}{4}$¢
32. 125 @ $1.20
33. $37\frac{1}{2}$ @ $2.48
34. 250 @ $45
35. 75 @ $44
36. $83\frac{1}{3}$ @ $1.20

Drill 61. Combinations of Aliquot Parts of 10, 100, etc. (Mental)

Find the cost of each of the following.

1. 15 @ $22
2. 175 @ $2.40
3. $12\frac{1}{2}$ @ $44
4. 1,500 @ 16¢
5. 1,250 @ 28¢
6. 1,750 @ 32¢
7. 150 @ $8.20
8. 125 @ 36¢
9. 1,250 @ $5.60
10. 175 @ $3.20
11. 150 @ 24¢
12. $12\frac{1}{2}$ @ $52
13. 1,750 @ $4.40
14. 15 @ $86
15. 125 @ 84¢
16. 1,500 @ 18¢
17. 1,750 @ 16¢
18. 150 @ $1.42
19. 125 @ $13
20. 175 @ $1.20
21. 15 @ 72¢
22. 1,250 @ $14
23. 1,500 @ $1.30
24. $12\frac{1}{2}$ @ $1.64

Drill 62. Aliquot Parts—General Review (Mental)

Find the cost of each of the following.

1. 150 articles @ $33\frac{1}{3}$¢
2. 25 bushels @ $2.16
3. 87 bushels @ $33\frac{1}{3}$¢
4. 56 crates @ $37\frac{1}{2}$¢
5. $16\frac{2}{3}$ yards @ 72¢
6. 84 bushels @ 75¢
7. 104 yards @ 25¢
8. 75 dozen @ 60¢
9. 64 bushels @ $87\frac{1}{2}$¢
10. 315 feet @ $3\frac{1}{3}$¢
11. 125 bushels @ 60¢
12. 125 articles @ 40¢
13. 48 bushels @ $1.75
14. 120 yards @ $1.25
15. 330 bushels @ $33\frac{1}{3}$¢
16. 320 dozen @ $87\frac{1}{2}$¢
17. 120 gallons @ 15¢
18. 75 yards @ 56¢
19. 125 bushels @ 80¢
20. 56 dozen @ $1.25
21. 120 articles @ $7\frac{1}{2}$¢
22. 660 yards @ $\$.66\frac{2}{3}$
23. 240 yards @ $\$.87\frac{1}{2}$
24. 96 yards @ 25¢
25. 72 dozen @ $1.25
26. 48 bushels @ $\$.66\frac{2}{3}$
27. 175 articles @ 32¢
28. 640 dozen @ $1.25
29. 360 articles @ 75¢
30. 48 articles @ $2.50
31. 125 articles @ $.16
32. 72 articles @ $\$.37\frac{1}{2}$
33. 630 articles @ $\$.66\frac{2}{3}$
34. 1,240 dozen @ $1.50

Drill 63. Aliquot Parts—General Review (Mental)

Find the cost of each of the following.

1. 50 dozen @ $12\frac{1}{2}$¢
2. 250 articles @ 9¢
3. 140 bushels @ $1.25
4. 45 yards @ $1.50
5. 28 gallons @ $\$.16\frac{2}{3}$
6. $12\frac{1}{2}$ pounds @ 36¢
7. 25 bushels @ $1.25
8. 150 bushels @ 75¢
9. 300 articles @ $\$1.12\frac{1}{2}$
10. 188 bushels @ $\$.16\frac{2}{3}$
11. 298 yards @ $33\frac{1}{3}$¢
12. 428 articles @ $\$.12\frac{1}{2}$
13. 170 pounds @ $\$.33\frac{1}{3}$
14. 27 quarts @ $\$.16\frac{2}{3}$
15. 50 bushels @ $1.25
16. 36 articles @ $12\frac{1}{2}$¢
17. 30 articles @ 75¢
18. 39 pounds @ 25¢
19. 30 bushels @ $1.25
20. 243 articles @ $12\frac{1}{2}$¢
21. 150 pounds @ 17¢
22. 125 yards @ $33\frac{1}{3}$¢
23. 45 dozen @ $\$1.16\frac{2}{3}$
24. 125 gallons @ $.36
25. 87 articles @ 25¢
26. 70 articles @ $2.50
27. 224 articles @ $33\frac{1}{3}$¢
28. 178 articles @ $12\frac{1}{2}$¢
29. 180 articles @ $1.25
30. 220 bushels @ $1.25
31. 442 articles @ $.25
32. 36 articles @ $12.50
33. 360 articles @ $12\frac{1}{2}$¢
34. 14 articles @ 25¢

Drill 64. Interest for Multiples of 6, 60, and 600 Days (Mental)

Find the interest at 6% on:

1. $350 for 6 da.
2. $1,300 for 18 da.
3. $940 for 48 da.
4. $220 for 12 da.
5. $1,650 for 42 da.
6. $840 for 24 da.
7. $320 for 54 da.
8. $370 for 36 da.
9. $342 for 120 da.
10. $270 for 180 da.
11. $81 for 420 da.
12. $160 for 240 da.
13. $210 for 360 da.
14. $105 for 540 da.
15. $41 for 1,200 da.
16. $37 for 1,800 da.
17. $17 for 4,800 da.
18. $25 for 3,600 da.
19. $29 for 2,400 da.
20. $21 for 4,200 da.
21. $13 for 5,400 da.

Drill 65. Interest for Aliquot Parts of 6, 60, and 600 Days (Mental)

Find the interest at 6% on:

1. $1,500 for 2 da.
2. $1,800 for 1 da.
3. $1,740 for 2 da.
4. $1,560 for 1 da.
5. $3,700 for 3 da.
6. $510 for 20 da.
7. $430 for 30 da.
8. $840 for 10 da.
9. $720 for 15 da.
10. $525 for 12 da.
11. $240 for 45 da.
12. $750 for 40 da.
13. $620 for 300 da.
14. $390 for 200 da.
15. $210 for 400 da.
16. $320 for 150 da.
17. $440 for 450 da.
18. $480 for 100 da.
19. $180 for 500 da.
20. $1,320 for 30 da.
21. $2,750 for 2 da.
22. $130 for 150 da.
23. $163 for 15 da.
24. $185 for 10 da.
25. $3,590 for 3 da.
26. $160 for 200 da.
27. $6,140 for 2 da.
28. $6,650 for 1 da.
29. $145 for 30 da.
30. $154 for 12 da.
31. $185 for 20 da.
32. $90 for 450 da.
33. $175 for 300 da.

Drill 66. Interest for Combinations of 6 and 60 Days with Parts of 6 and 60 Days (Mental)

Find the interest at 6% on:

1. $160 for 9 da.
2. $210 for 8 da.
3. $720 for 7 da.
4. $1,400 for 9 da.
5. $660 for 7 da.
6. $2,700 for 8 da.
7. $400 for 90 da.
8. $160 for 75 da.
9. $360 for 80 da.
10. $180 for 70 da.
11. $250 for 72 da.
12. $500 for 66 da.
13. $270 for 80 da.
14. $360 for 66 da.
15. $840 for 70 da.
16. $250 for 90 da.
17. $240 for 75 da.
18. $1,250 for 90 da.
19. $65 for 72 da.
20. $990 for 80 da.
21. $42 for 70 da.

Drill 67. Interchange of Principal and Time (*Mental*)

By the interchange method, find the interest at 6% on:

1. $60 for 21 da.
2. $600 for 19 da.
3. $6,000 for 13 da.
4. $600 for 26 da.
5. $6,000 for 37 da.
6. $60 for 46 da.
7. $30 for 46 da.
8. $90 for 46 da.
9. $15 for 160 da.
10. $75 for 160 da.
11. $30 for 108 da.
12. $90 for 62 da.
13. $15 for 132 da.
14. $75 for 124 da.
15. $120 for 65 da.
16. $360 for 41 da.
17. $240 for 17 da.
18. $480 for 23 da.
19. $180 for 34 da.
20. $540 for 16 da.
21. $600 for 34 da.
22. $300 for 34 da.
23. $200 for 39 da.
24. $400 for 27 da.
25. $150 for 56 da.
26. $450 for 32 da.
27. $100 for 96 da.
28. $600 for 29 da.
29. $300 for 26 da.
30. $900 for 26 da.
31. $200 for 21 da.
32. $800 for 21 da.
33. $600 for 51 da.
34. $1,200 for 51 da.
35. $3,600 for 14 da.
36. $2,400 for 43 da.
37. $1,800 for 35 da.
38. $3,600 for 25 da.
39. $1,200 for 83 da.
40. $6,000 for 78 da.
41. $2,000 for 78 da.
42. $1,500 for 64 da.
43. $2,000 for 126 da.
44. $1,500 for 108 da.
45. $3,000 for 19 da.

Drill 68. Interest Review (*Mental*)

Find the interest at 6% on:

1. $600 for 46 da.
2. $28.74 for 30 da.
3. $240 for 90 da.
4. $300 for 45 da.
5. $100 for 96 da.
6. $1,500 for 22 da.
7. $3,600 for 80 da.
8. $7,000 for 9 da.
9. $800 for 72 da.
10. $79.68 for 30 da.
11. $600 for 147 da.
12. $3,500 for 9 da.
13. $725 for 66 da.
14. $804 for 12 da.
15. $300 for 31 da.
16. $1,200 for 73 da.
17. $542 for 90 da.
18. $300 for 112 da.
19. $84 for 70 da.
20. $425 for 30 da.
21. $1,200 for 47 da.
22. $390 for 24 da.
23. $480 for 90 da.
24. $120 for 40 da.
25. $600 for 148 da.
26. $1,200 for 74 da.
27. $360 for 66 da.
28. $30 for 71 da.
29. $1,800 for 90 da.
30. $600 for 20 da.
31. $480 for 30 da.
32. $900 for 23 da.
33. $1,200 for 23 da.
34. $87.20 for 30 da.
35. $1,200 for 78 da.
36. $951 for 20 da.
37. $400 for 18 da.
38. $800 for 33 da.
39. $50.50 for 60 da.
40. $900 for 22 da.
41. $150 for 72 da.
42. $800 for 26 da.
43. $250 for 90 da.
44. $100 for 18 da.
45. $1,200 for 49 da.
46. $14 for 45 da.
47. $250 for 9 da.
48. $650 for 72 da.
49. $360 for 26 da.
50. $660 for 40 da.
51. $250 for 72 da

Drill 69. Interest for Fractional Parts of 6% (*Mental*)

In solving each of the following problems, first find the interest mentally at 6%, and then multiply that result by the fractional equivalent of the given rate.

1. $1,500 for 6 days at 6%
2. $160 for 30 days at 1½%
3. $300 for 20 days at 4½%
4. $36 for 60 days at 5%
5. $360 for 30 days at 4%
6. $660 for 60 days at 5%
7. $250 for 48 days at 4½%
8. $240 for 15 days at 4%
9. $200 for 3 months at 3%
10. $320 for 3 months at 4½%
11. $160 for 3 months at 5%
12. $320 for 30 days at 4½%
13. $120 for 15 days at 3%
14. $128 for 15 days at 3%
15. $500 for 4 months at 2%
16. $600 for 72 days at 3%
17. $160 for 3 months at 1½%
18. $270 for 120 days at 2%
19. $480 for 30 days at 1½%
20. $600 for 39 days at 2%

Drill 70. Interest for Fractional Parts of 6% (*Mental*)

When the interest rate is a fractional part of 6%, some problems are most easily solved by finding the interest at 6% for a fractional part of the days or months given in the time.

By this method, the interest on $840 for 20 days at 4½%, for example, would be calculated in the following manner:

4½% = ¾ of 6%
¾ of 20 da. = 15 da.
Int. at 6% on $840 for 15 da. = $2.10

In each of the problems given below, find the interest mentally by the method shown above.

1. $327 for 80 days at 4½%
2. $900 for 36 days at 5%
3. $450 for 15 days at 4%
4. $360 for 6 months at 2%
5. $240 for 3 months at 2%
6. $420 for 45 days at 4%
7. $280 for 4 months at 4½%
8. $72 for 36 days at 5%
9. $360 for 40 days at 4½%
10. $250 for 6 months at 3%
11. $630 for 8 days at 4½%
12. $220 for 4 months at 3%
13. $450 for 80 days at 4½%
14. $175 for 6 months at 2%
15. $1,000 for 72 days at 5%
16. $420 for 3 months at 2%
17. $300 for 45 days at 2%
18. $480 for 15 days at 4%
19. $437 for 4 months at 3%
20. $150 for 40 days at 1½%
21. $240 for 90 days at 4%
22. $320 for 3 months at 4%

Drill 71. Interest Review (Mental)

Find the interest on:

1. $30 for 19 days at 6%
2. $120 for 20 days at 4½%
3. $400 for 90 days at 3%
4. $266 for 36 days at 6%
5. $840 for 20 days at 4½%
6. $1,260 for 72 days at 3%
7. $3,570 for 54 days at 6%
8. $980 for 90 days at 4%
9. $630 for 60 days at 4%
10. $784 for 30 days at 3%
11. $42 for 36 days at 6%
12. $360 for 24 days at 4½%
13. $1,275 for 6 days at 3%
14. $600 for 80 days at 4½%
15. $60 for 6 months at 4%
16. $600 for 3 months at 2%
17. $240 for 15 days at 6%
18. $360 for 60 days at 4½%
19. $180 for 9 days at 6%
20. $457.50 for 60 days at 6%
21. $360 for 30 days at 4%
22. $225 for 120 days at 3%
23. $600 for 15 days at 2%
24. $500 for 3 months at 6%
25. $180 for 20 days at 4½%
26. $480 for 30 days at 4%
27. $600 for 90 days at 2%
28. $120 for 10 days at 6%
29. $600 for 3 months at 2%
30. $400 for 80 days at 4½%
31. $500 for 36 days at 5%
32. $380 for 15 days at 3%
33. $480 for 80 days at 4½%
34. $600 for 159 days at 4%

Drill 72. Interest Review (Mental)

Find the interest on:

1. $1,360 for 42 days at 6%
2. $400 for 3 months at 1½%
3. $138 for 80 days at 6%
4. $300 for 30 days at 4%
5. $288 for 15 days at 6%
6. $160 for 2 months at 4½%
7. $180 for 10 days at 5%
8. $900 for 22 days at 6%
9. $153 for 20 days at 4%
10. $600 for 72 days at 3%
11. $250 for 30 days at 6%
12. $540 for 12 days at 5%
13. $420 for 24 days at 4½%
14. $625 for 60 days at 1½%
15. $200 for 36 days at 6%
16. $990 for 4 months at 3%
17. $1,200 for 54 days at 2%
18. $880 for 33 days at 6%
19. $812 for 4 months at 6%
20. $560 for 30 days at 3%
21. $720 for 60 days at 5%
22. $1,600 for 2 months at 4½%
23. $60 for 78 days at 2%
24. $150 for 90 days at 6%
25. $200 for 1 year at 1½%
26. $600 for 28 days at 3%
27. $450 for 1 year at 2%
28. $240 for 30 days at 3%
29. $680 for 2 months at 4½%
30. $1,200 for 38 days at 6%
31. $500 for 1 year at 2½%
32. $180 for 4 months at 6%
33. $360 for 26 days at 6%
34. $240 for 45 days at 4%

SUPPLEMENTARY PROBLEMS

The following problems have been adapted from problems given in final examinations and civil service examinations in business arithmetic. The problems are classified by units to correlate with the text.

UNIT I

1. Dix & Brown deposited the following: 67 pennies, 38 nickels, 63 dimes, 25 quarters, 30 half dollars, 23 dollars, 3 five-dollar bills, 5 ten-dollar bills, 4 twenty-dollar bills, and checks for $46.75, $3.86, $62.47, $36.43, $4.59, and $16.79. Find the amount of the deposit.

2. An individual deposited in the bank the following: 49 pennies, 72 nickels, 21 dimes, 89 quarters, 9 half dollars, 96 one-dollar bills, 5 two-dollar bills, 6 five-dollar bills, 2 ten-dollar bills, 3 twenty-dollar bills, and checks for $2.57, $3.89, $10.50, $1.32, and $198.76. (a) What was the total of the deposit not including the checks? (b) What was the total of the checks? (c) What was the total deposit?

3. Landon's bank statement showed a balance of $312.84. His checkbook balance was $103.72. Checks for $86.12, $119.21, and $5.29 were outstanding, and the bank had deducted a service charge of $1.50. Prepare a reconciliation statement.

4. On December 31, Robert Bowen's checkbook balance was $849.12. His bank statement showed a balance of $1,191.86. Checks were outstanding for $79.84; $59.73; $27.60. A deposit of $175.57 had been omitted from the checkbook by error. Prepare a reconciliation statement.

5. On March 1, John Willoughby's checkbook balance was $560.10 and his bank statement balance was $831.26. Among his canceled checks there is a service charge slip of $2.73. Upon comparing the canceled checks with the checkbook, he found a check for $97.89 had been issued but not cashed. The deposit of February 15, for $176, had been omitted from the checkbook. Prepare a reconciliation statement.

6. On May 1, James Horton's bank statement showed a balance of $462.50. His checkbook balance was $554.63. Checks were outstanding for $21.50; $119.28; $37.84. A deposit of $268.75, which had been properly recorded in the checkbook, had been received by the bank too late to be entered on the statement. Along with the canceled checks Horton found a service charge slip for $2.00. Prepare a reconciliation statement.

UNIT II

1. Find the cost of (a) 135 pounds of scratch feed at $4.60 a hundred pounds and (b) 1,560 pounds of coal at $24.80 a ton.

2. Pencils used in an office may be bought at the price of two for five cents or, when bought in large quantities, at the price of $1.38 for six dozen. What is the saving per dozen when pencils are bought at the lower rate?

3. Walters, a radio dealer, buys 48 sets at $45 each. He sells 25 of them at $70 each, 20 at $60 each, and the remainder at $40 each. What is the average profit per set which Walters makes on the entire transaction, to the nearest tenth of a cent?

4. If 10 rulers are purchased at $1.20 a dozen and 15 rulers are purchased at $.84 a dozen, the average price paid for each ruler is how much?

5. The Acme Sales Company conducted a contest for its salesmen. Potter's average sales for the last nine weeks of last year were $379.65. For the first four weeks of this year, his sales amounted to $376.14, $625.32, $429.53, and $374.52, respectively. Find Potter's average weekly sales for the 13 weeks.

6. Weatherby, in order to operate his furnace and hot water heater last winter, bought the following amounts of coal:

5 tons of egg coal at $20.75 per ton
3 tons of chestnut coal at $20.25 per ton
4 tons of buckwheat coal at $17.00 per ton

What was the average price per ton, to the nearest cent, that Weatherby paid for his coal?

7. In January, Howell opened a savings account and made monthly deposits of varying amounts. By the end of August, he had deposited a total of $492.50. His deposits for the rest of the year are shown below:

September	$56.50	November	$52.75
October	$48.00	December	$46.25

What average amount per month did Howell save during the entire year?

8. A pupil received the following grades: typewriting, 75%; business arithmetic, 81%; English, 92%; drawing, 83%. What per cent must he receive in shorthand in order that he may have an average of 85%?

9. Albert's marks on four tests were 80, 90, 80, and 85. What mark must he receive on the next test in order to have an average of 85 on all five tests?

UNIT III

1. From a bolt of cloth containing $46\frac{7}{8}$ yards, the following pieces were cut: $3\frac{3}{4}$ yards; $5\frac{1}{4}$ yards; $6\frac{3}{8}$ yards; $8\frac{5}{6}$ yards. How much cloth is left in the bolt?

2. Find the total cost of the following: $7\frac{1}{2}$ lb. roast @ $1.09; 3 lb. rice @ $.18; $6\frac{3}{4}$ lb. beef @ $.78; a sack of flour @ $2.09; $1\frac{1}{2}$ bu. potatoes @ $2.75; canned goods @ $2.46.

3. Find the total cost of the following: 375 pineapples @ $24.75 a hundred; 4 bags of coffee, each containing 50 pounds, @ $63\frac{1}{2}$ cents a pound; 4 crates of eggs, each containing 30 dozen, @ 59 cents a dozen; 64 bags of sugar, each containing 25 pounds, @ $8\frac{3}{4}$ cents a pound; 3 cases of peas, each containing 2 dozen cans, @ $2.75 a dozen; 2 chests of tea, each containing 95 pounds, @ 98 cents a pound; 74 packages of paper bags, each containing 50 bags, @ $6 per thousand.

4. A customer bought $1\frac{1}{3}$ dozen handkerchiefs at $2.49 a dozen; $\frac{1}{2}$ dozen towels at $5.49 a dozen; $\frac{3}{4}$ dozen washcloths at $2.39 a dozen; $\frac{1}{2}$ dozen athletic shirts at 69¢ apiece; and one pair of socks at 79¢. He gave in payment a $20 bill. How much change should he receive?

UNIT IV

1. The Eastern Electric Company pays its employees time and a half for overtime. Regular factory hours are 8 hours a day from Monday to Friday, inclusive. All other working time is considered to be overtime. During the week of January 8, James Jones was employed as follows: Monday, 7 hours; Tuesday, $8\frac{1}{2}$ hours; Wednesday, 9 hours; Thursday, $10\frac{1}{2}$ hours; Friday, 6 hours; Saturday, 5 hours. If his wage rate was $1.75 an hour, what was the amount of his wages for the week?

2. Harrison is employed at the Emerson Glove Co. on a piecework basis and is paid 6¢ for each piece completed and accepted. During a recent week he completed the following number of pieces:

Monday	210	Wednesday	190	Friday	189
Tuesday	231	Thursday	216		

A total of 11 pieces of work were not accepted. What were Harrison's total earnings for that week?

3. Alvord, a salesman, is paid a commission of 10% on all sales and an additional commission of 5% on all sales in excess of $500 per week. During a recent week, Alvord's sales amounted to $618. What were Alvord's total earnings for the week?

4. Wheaton, a salesman, is paid 10% on all sales, and an additional commission of 5% on all sales in excess of $2,500 per month. His sales were as follows: March, $2,190; April, $2,450; May, $3,140. What was the total amount of commission earned by Wheaton for these three months?

5. Thomas Evans is offered two positions as a salesman. The Black Company will pay him $50 a week salary and 5% commission on all his sales in excess of $200. The White Company offers him 15% on all sales up to and including $250, and 20% on all sales in excess of that amount. Mr. Evans accepts the offer of the Black Company. His record for the first week shows sales of $375. (a) Find the amount of his earnings for the week with the Black Company. (b) If he had accepted the offer of the White Company and had been able to make the same amount of sales, what would his earnings have been?

6. Miss Wilson is a sales lady in a department store and is paid a weekly salary of $35, with a commission of $5\frac{1}{2}$¢ per pair on all hosiery sales in excess of 70 pairs per week. During the first week in June she sold 98 pairs, and during the second week 64 pairs. What were her total earnings for the two weeks?

7. Herman, a salesman, receives a monthly salary of $200, and is also paid commissions of varying rates on different sales. During 1953, his total earnings, including both salary and commissions, were $7,600. If his sales for the year were $65,000, what average per cent of commission did he earn?

8. Lowe, a salesman, received a monthly salary of $160 and various rates of commission on different articles. His total earnings for last year, including both salary and commissions, were $3,990. If his annual sales amounted to $34,500, his commissions were what per cent of his sales?

9. If a salesman receives a commission of 8%, what was the total of his sales on a day when his commission amounted to $19?

10. A real estate agent sold a house and after deducting 5% commission remitted $4,750 to the former owner. What was the selling price of the house?

11. The average weekly sales for the four-week period ending December 31, 1948, were reported by the Ryan Company to have amounted to $1,650. During the same period of 1949 the weekly sales were reported as follows: 1st week, $1,723.80; 2nd week, $2,904.18; 3rd week, $1,001.30; 4th week, $3,170.72. Determine the per cent of increase or decrease of the average weekly sales for this selected period of 1949 as compared to 1948.

UNIT V

1. Summers discounted at 6% his 60-day non-interest-bearing note for $450 at the bank. Find the proceeds of the note.

2. W. E. Bowen paid the following note by check on November 3 of the same year in which the note was issued. What was the amount of the check?

No. *95* *San Francisco, Calif., August 2,* 19--

On demand *I* promise to pay to the order of..............

.................*Citizens Bank*......................*$650.00*

Six Hundred Fifty and 00/100........................Dollars

For value received.

With interest at *6%* at the *Citizens Bank.*

W. E. Bowen

3. Gates can borrow $240 from his bank, repaying the loan in five monthly payments of $49.40 each. He can borrow the same amount from a credit union, of which he is a member, repaying the loan in five monthly payments of $48 each plus interest at $\frac{3}{4}\%$ per month on the unpaid balance. (a) How much interest would Gates pay the bank for the loan? (b) How much interest would he pay the credit union? (In your solution show the interest to be paid each month.) (c) From which loan institution would it be better to borrow? (d) How much better?

4. Your father wishes to borrow $120. A finance company will lend him $120, charging 2% interest each month on the unpaid balance. He can borrow $120 from the bank, paying back $30 each month on the principal. The total interest and bank charges will be $2.50. (a) If he borrows $120 from the finance company and pays back $30 each month on the principal, what will be the total interest cost? (In your solution show the interest to be paid each month.) (b) From which loan institution would it be better to borrow? (c) How much better?

5. Mr. Roberts borrowed $100 on a note. The lender subtracted 4% in advance and made a service charge of $2. The amount borrowed was repaid in 10 monthly payments of $10 each. What rate of interest did he pay for the time borrowed?

6. Mrs. Davis can buy a washing machine for $100 cash or on the deferred payment plan, paying $40 down and five monthly installments of \$15 each. By what per cent does the installment price exceed the cash price?

7. Mrs. Carter can purchase an electric refrigerator for \$240 cash, or on the deferred payment plan, paying \$70 down and 7 monthly installments of \$30 each. The installment price is what per cent greater than the cash price?

8. Harrison can buy a television set for \$280 by paying cash or on the installment plan by paying 15% more. He chooses the installment plan and makes a down payment of \$75. If he pays the balance in 10 monthly installments, what amount of money must he pay for each installment?

9. When buying a new delivery truck costing \$2,800, Wilson turned in his old truck and received a trade-in allowance of \$700. The carrying charge was 8% of the unpaid balance. The unpaid balance and carrying charge was paid by Wilson in 12 equal monthly installments. How much money did he pay in each installment?

10. Beale can purchase a washing machine for a total cost of \$225 by paying $33\frac{1}{3}\%$ of the price as a down payment, and the balance in equal monthly installments of \$12.50 each. How many months will it take him to pay for the machine?

11. Caldwell can buy an air conditioner on the installment plan for a total cost of \$350, by paying 40% of the cost as a down payment and the balance in equal monthly payments of \$35 each. How many months will it take him to pay for the air conditioner?

12. A piece of equipment can be bought for a cash price of \$1,000. The installment price is \$200 down plus 12 monthly payments of \$72 each, which includes all interest and carrying charges. (a) What per cent of the unpaid balance is added for interest and carrying charges? (b) If a person had enough cash for the down payment and could borrow the balance at 6% a year, how much would he gain or lose by purchasing at the cash price?

13. Randall has \$100 cash and wishes to buy a set of dining room furniture. The cash price of this set is \$450. Randall can, if he chooses, buy the set on the installment plan by paying \$100 down and 12 equal monthly installments of \$32.50 each. He borrows from a bank for one year, at 6% annual interest, the additional amount he needs to pay the cash price. How much money does he save by borrowing to pay the cash price instead of buying on the installment plan?

UNIT VI

1. On January 2, 1953, Davis deposited $1,600 in a savings bank which paid interest at the rate of $1\frac{1}{2}\%$ per year. Interest was figured and added to the account every 6 months. How much interest did Davis' account earn for him during 1953 if he made no additional deposits or withdrawals during the year?

2. On July 1, 1953, Harvey deposited $480 in a savings bank which paid interest at the rate of $1\frac{3}{4}\%$ per year. Interest was added to the account every six months. How much money did Harvey have on deposit in the bank at the end of one year if he made no additional deposits or withdrawals during that time?

3. On January 2, 1952, King opened a savings account of $300 with the United Savings Bank. The bank pays interest at an annual rate of 2%. Interest is added to the account on July 1 and on January 2 of each year. On January 2, 1953, King deposited $150 additional in this account. How much money, including interest, did he have in the account on July 1, 1953?

4. On January 2, 1952, Pearson deposited $500 in a savings bank that paid interest at the rate of 2% per year. Interest was added to the account every six months. On July 1, 1952, Pearson made an additional deposit of $300. How much money did he have on deposit two years after the date of his first deposit, if he made no withdrawals during those two years?

5. On July 1, Miller deposited $3,000 in a savings bank. The bank pays interest at the annual rate of $1\frac{3}{4}\%$. Money on deposit for less than 6 months does not earn interest. On December 1 of the same year, Miller needed $3,000. He could borrow this amount at $4\frac{1}{2}\%$ for 30 days or withdraw his savings and lose the interest. Which plan should Mr. Miller have followed and how much would he have gained?

6. Miller carries a life insurance policy for $5,000 at an annual rate of $26.50 per $1,000. This year his policy earned him a dividend of $3.86, which he will be allowed to deduct from his next premium. What net amount will Miller send to the insurance company as payment for his next year's premium?

7. Bailey bought hospitalization, medical, and surgical insurance by paying a quarterly premium of $6.25. After he had paid premiums for 8 years, he entered a hospital for an operation, which cost as follows: hospital room and board, 10 days at $10.50 per day; surgery fee, $200; bandages and medicine, $15; operating room and anesthetic fee, $20. The entire cost of this illness was paid by the insurance company. How much did Bailey save by having this insurance protection?

8. A share of stock with a par value of $100 pays a quarterly dividend of $1.40. If Stokes buys a share for a total cost of $80, including brokerage and other expenses, what actual per cent of dividend does he receive on his investment?

9. Kilmer bought a share of stock for $82, including brokerage and other expenses. This stock paid a dividend of 5% on a par value of $100. What actual per cent of return did Kilmer receive on his investment, to the nearest tenth of a per cent?

10. Lister bought 80 shares of preferred stock for $7,200, including brokerage and other expenses. He kept the stock for a year, during which time he received quarterly dividends of $1.25 per share. At the end of that time, he sold the stock and received $7,840 after brokerage and taxes had been deducted. What was Lister's total gain on the stock?

11. In January 1951, Cook purchased a share of stock for $98, including brokerage and other expenses. During the next three years, he received annual dividends as follows: 1951, $6.40; 1952, $7.08; 1953, $7.10. What average per cent of return did Cook receive on his investment?

12. Sherman bought 50 shares of stock for a total cost of $5,863.50, including brokerage and other expenses. He kept this stock for two years, during which time it paid regular dividends quarterly of $2.10 per share. After receiving dividends for two years, Sherman sold the stock and received $5,718.90 after brokerage and other expenses had been deducted. What was Sherman's net gain on the stock?

13. How much must be invested in 6% preferred stock at 120 to receive annual dividends of $1,200? (Disregard brokerage fee.)

14. Keefe bought a house for $11,500 cash. He rented it to a tenant for $90 a month. During the first year he owned the house, Keefe paid the following expenses: taxes, $243.50; repairs, $92.75; insurance and other expenses, $46.90. What rate of net income, to the nearest tenth of a per cent, did Keefe make on his investment during the first year of ownership?

15. Hawkins built an apartment house, containing six apartments, for $48,000. Estimated annual expenses connected with owning this building are: taxes, $834; insurance, $120; fuel, $330; repairs, depreciation, and other expenses, $996. What monthly rent must Hawkins charge for each of the six apartments in order to meet these expenses and receive a net income of 8% on his investment?

UNIT VII

1. (a) On January 2, 1953, Gregg purchased for $12,500 the house in which he had been living and for which he had been paying rent, obtaining the necessary funds by selling bonds that had been earning 4% interest annually. How much interest did Gregg lose in 1953 by selling his bonds in order to buy the house?

(b) During 1953, Gregg paid taxes on the house at the rate of $31.50 per $1,000 on an assessed valuation of $6,000. What was the amount of taxes he paid on the house in 1953?

(c) Insurance cost $25 per year, and repairs and other expenses $250. How much more money, including taxes and lost interest on the bonds, did it cost Gregg to own the house during 1953 than it would have cost had he continued to rent it at $60 a month?

2. Mr. Layton bought a house last year for $9,600. He paid $5,100 in cash and gave a 5% mortgage for the balance. (a) What is the annual cost to Mr. Layton for interest on the mortgage? (b) The tax rate in the community this year is $27.50 per $1,000. If the house is assessed at 80% of value, what will be the amount of the tax on Mr. Layton's house? (c) In addition to taxes and interest, Mr. Layton's other operating expenses are $172 during the year. If he rents the house at $70 per month, what is the annual rate of net income on his investment, to the nearest tenth per cent?

3. Edmonds owns a house and lot assessed at $6,400 and two additional lots, each of which is assessed for $850. Last year the tax rate in his community was $27.80 per $1,000. What tax did he pay on this property last year?

4. The assessed valuation and the city tax rate on a piece of real estate were as follows:

	Assessed Valuation	Rate per $1,000
1951	$ 9,000	$30.20
1952	$10,500	$31.40
1953	$11,000	$32.10

What were the average yearly taxes paid by the owner of this property for the three-year period?

5. Mosher insured his store building for $16,000 at an annual rate of 21¢ per $100. If a three-year policy costs 2½ times as much as a one-year policy, what amount would Mosher have saved by buying a three-year policy instead of three separate one-year policies?

6. Blair insured his building, valued at $16,000, for $9,600 under a policy containing an 80% co-insurance clause. A fire loss of $8,400 occurred. How much should Blair collect from the fire insurance company?

7. Fallon insured his office building, valued at $65,000, for $45,500 under a policy containing an 80% co-insurance clause. A fire loss of $5,600 occurred. How much should Fallon collect from the insurance company?

8. (a) Milford's store building is valued at $15,000. He wishes to insure it for $10,000 under a policy carrying an 80% co-insurance clause. The annual rate for this policy is 18¢ per $100. What amount would Milford pay for one year's protection? (b) If a three-year policy costs $2\frac{1}{2}$ times as much as a one-year policy, how much would Milford save by buying a three-year policy instead of 3 separate one-year policies? (c) In case a fire loss of $5,400 occurred in Milford's building, how much would the insurance company pay him for his loss?

9. Bethel insured his office building for $20,000 with the Empire Insurance Company and for $12,000 with the White Insurance Company. If a fire loss of $2,400 occurred, what amount should be paid by the White Company?

10. Walsh insured his store building for $30,000 with the Zenith Insurance Company and for $18,000 with the Acme Insurance Company. If a fire loss of $20,000 occurred, what amount of money would Walsh receive from the Zenith Insurance Company?

11. Birchall insured his house for $10,000 with the ABC Insurance Company and for $6,000 with the XYZ Insurance Company. A fire loss of $3,264 occurred. What amount of money should Birchall collect from each of the two insurance companies?

12. Reid's electric meter read 19,913 kilowatt hours on November 2. Two months later it read 20,081 kilowatt hours. If the average cost per kilowatt hour was $5\frac{1}{2}$¢, what was the amount of Reid's electric bill for the two months?

13. Ferguson's electric meter read 6,873 kw-hr on April 1 and 6,988 kw-hr on May 1. He paid the following rates for electricity:

The first 30 kw-hr at $5\frac{1}{2}$¢ per kw-hr
The next 50 kw-hr at 5¢ per kw-hr
The remaining kw-hr at 4¢ per kw-hr

What was the amount of Ferguson's electric bill for April?

14. The monthly rates for gas for heating purposes in a certain area are as follows: 80¢ for the first 400 cubic feet; the next 2,600 cubic feet at 16¢ per 100 cubic feet; the next 3,000 cubic feet at 7¢ per 100 cubic feet; and the next 15,000 cubic feet at 6¢ per 100 cubic feet. Find the amount of Meyer's gas bill for the month of January if he used 16,400 cubic feet.

UNIT VIII

1. A truck which cost $2,400 had a trade-in value of $1,500 after three years of use. What was the average annual per cent of depreciation?

2. A delivery truck costing $2,450 when new is worth $294 after eight years of use. What was the average annual per cent of depreciation on the truck?

3. The Stanley Company bought a truck for $2,000. After using it for 4 years, the company bought a new truck for $2,800, trading in the old truck and paying $1,600 in cash. What was the average annual depreciation on the original truck?

4. The Oliver Company purchased a delivery truck for $2,600. At the end of one year, they sold it for $2,300. In addition to the depreciation, the expenses for operating the truck were: repairs and servicing $40, gas and oil $622, licensing and insurance $198. The truck was driven 12,673 miles. What was the average cost per mile of operating it, to the nearest tenth of a cent?

5. Gregg started on an automobile trip at 8:30 a.m. and arrived at his destination at 5:45 p.m. If he spent one hour and fifteen minutes for lunch and fifteen minutes for obtaining gasoline and oil, what total time did he spend for the actual driving on the trip?

6. Carlyle's automobile speedometer reading was 27,886 miles at the start of a trip, and 28,212 miles when he reached his destination. If the actual time spent in driving was 7 hours 30 minutes, what was the average speed per hour which Carlyle drove, correct to the nearest tenth of a mile?

7. Scott drives his car 12 miles in 18 minutes. What is his speed per hour?

8. A bus travels 5 miles in 10 minutes. At this rate what is its speed per hour?

9. Rogers started on a motor trip at 8:30 a.m. and arrived at his destination at 5:15 p.m. During the trip he stopped one hour for lunch. His speedometer registered 16,896.4 miles at the start of the trip and 17,198.1 miles at the end.

(a) How many miles did he travel in making this trip?

(b) How many hours were spent in actual driving?

(c) What was the average speed in miles per hour at which he drove, based on actual driving time? (Express your answer correct to the nearest tenth of a mile.)

10. A train left Grand Central Terminal in New York City at 1:30 p.m. and arrived in Albany, New York, at 4:50 p.m. The train stopped at Harmon, New York, for 20 minutes to station engines. The distance from Grand Central to the Albany change is 142 miles. What was the average speed in miles per hour which this train travelled, correct to the nearest tenth of a mile?

11. A round-trip railroad ticket between Pittsburgh and Chicago costs $27.50. The distance between Pittsburgh and Chicago is 468.4 miles. What is the average cost, to the nearest tenth of a cent, of transportation per mile for the round trip?

UNIT IX

1. In a certain community, the total assessed valuation of all taxable property was $3,857,219. The total amount of taxes to be raised was $132,596. What was the tax rate per $1,000 that was necessary to raise the desired tax?

2. In a certain village, the amount of money needed for the total expenses for the year was $286,350. Of this amount, $2,847 was expected to be received from fines, licenses, and other revenue. If the total assessed valuation of all taxable property in the village was $8,646,280, what tax rate per $1,000 would need to be levied in order to raise the necessary funds?

3. The village of Dunlap received a revenue of $18,312 from licenses, fines, etc., during last year. If the village also levied a real-estate tax of $31.65 per thousand on property with a total assessed valuation of $3,864,000, what was the total revenue for the year?

4. The taxes to be raised in a certain village amounted to $1,953.75. The tax rate was $15.63 per $1,000. Find the assessed valuation.

5. Fisher paid $104.40 taxes on his house assessed at $4,500. What was the tax rate per $1,000?

6. A watch marked at $70 is subject to a 20% Federal tax on the marked price. What price must a customer pay for this watch?

7. Finn's July telephone bill for local service was $4.80. This bill was subject to a Federal tax of 15%. In addition, Finn made long distance calls totalling $3.84, which were subject to a 25% Federal tax. What amount of money did Finn send to the telephone company to pay the entire bill, including tax?

8. Ellis paid $14.79 for a lamp. This price included a 2% retail sales tax based on the original marked price. What was the original marked price?

9. A diamond ring sold for $780.00. This selling price included a Federal tax of 20% on the original price. What was the original price before the tax was added?

10. Jones worked 38 hours in a certain week. His rate of pay was 90 cents an hour. Deductions from his earnings were as follows: 1½% for federal old-age benefits, $4.10 for federal income tax, $.47 for hospitalization. What amount should he receive after all deductions have been made?

11. Simmons works in a factory and is paid $1.10 per hour regular time for a 40-hour week, with time and a half for overtime. During a certain week, he worked 44 hours. One and one half per cent of his total pay was deducted for federal old-age benefits, $7.20 for federal income tax, $.25 for Community Chest donation, and $.60 for insurance and hospitalization. What was the amount of money Simmons received after all deductions had been made?

12. Penn is employed on a 40-hour-per-week basis at $1.30 per hour, with time and a half for overtime. Last week he worked 48 hours. One and one half per cent of his total pay was deducted for Federal old-age benefits, $8.50 for Federal income tax, $5.00 for his savings account, and $.75 for insurance and hospitalization. What amount of money did Penn receive after all deductions had been made?

13. Gregg works on an eight-hour-per-day basis, with time and a half for all time over 8 hours per day. During a recent week he worked the following hours: Monday, 10 hours; Tuesday, 7 hours; Wednesday, 8 hours; Thursday, 9 hours; Friday, 9 hours. His regular hourly pay rate was $1.40 per hour. The total deductions from his pay, for social security and withholding tax, amounted to $8.35. What amount of money did Gregg receive for his week's work, after all deductions had been made?

14. Shelton's state income tax return for last year showed a total income for the year of $5,286. He was entitled to deduct the following exemptions:

Head of family	$2,500.00
Taxes paid	352.00
Interest on debts	19.00
Contributions to church and charity	115.00
Miscellaneous	82.00

His remaining taxable income was subject to a tax of 2% on the first $1,000 and 3% on the next $2,000 or any fraction thereof. What was the total of Shelton's state income tax?

UNIT X

1. At the beginning of November, Jones & Smith had goods on hand amounting to $9,225. During the month they purchased goods worth $6,878. If at the end of the month the goods on hand amounted to $5,269, find the cost of the goods sold during November.

2. During the month of December, Mr. Radcliffe made a profit of $3,795.22 on sales amounting to $17,652.20. The profit for that month was what per cent of the sales? (Find to the nearest tenth per cent.)

3. Ellington, an office-equipment dealer, wishes to buy 20 portable typewriters for his store. The Arden Company offers him a price of $60 per machine, less $16\frac{2}{3}\%$ and 10%. Total freight charges, which Ellington must pay, would amount to $16.30. How much will Ellington pay for the 20 machines if he buys them from the Arden Company?

4. A corporation purchased goods on October 7 for $3,800, terms 3/10, 1/20, n/30. The bill was paid on October 25. How much more would have been saved if the invoice had been paid on October 16?

5. On November 22, Leonard bought 10 adding machines at $120 each less a trade discount series of 25% and 10%. The terms of payment were 2/10, n/30. For what amount should Leonard write a check in payment for these machines on December 1?

6. Harrison can buy some office equipment he needs from the Superior Company for $1,600, less 25% and 10%, terms 2/10, n/30. He can buy similar equipment from the Atlas Company for $1,500, less 30%, terms n/30. Harrison is able to pay cash for his purchase. How much will he save by accepting the better of the two offers?

7. Booth needs to buy 10 calculating machines for use in his office. The Lucas Company has offered him a price of $120 per machine, less 20% and 10%, terms n/60. The Wheeler Company has offered him a price of $140 per machine, less 35%, terms 2/10, n/60. If Booth can afford to pay cash for his purchases, what total amount will he save by accepting the better offer of the two?

8. On January 4, Nolan bought an invoice of goods for $1,890, less 20% and 5%, terms 3/10, 1/30, n/60. (a) What will be the amount of the check if Nolan pays the invoice on March 5? (b) Nolan borrowed the necessary cash for 50 days at 5% and paid the invoice January 14. How much did he save?

9. (a) On October 20, Pierce bought goods for $1,150 less 10%, terms 2/10, n/30. What amount will he have to pay to settle this invoice on October 29? (b) In order to get sufficient funds to pay the bill and deduct the cash discount, Pierce borrowed the necessary amount from the bank on his 20-day 6% note. How much will he have to pay the bank when this note is due? (c) How much did Pierce save by borrowing money and paying the bill on October 29?

10. The cashier in a cafeteria separated her lunch checks for a certain period in the day and discovered that she had the following:

8 for 12¢
10 for 15¢
13 for 18¢
20 for 20¢
32 for 23¢
35 for 25¢
41 for 30¢
72 for 35¢
99 for 40¢
135 for 45¢
181 for 50¢
120 for 60¢

(a) How many lunch checks did the cashier handle? (b) What were the total sales? (c) Find, to the nearest tenth of a cent, the average amount paid per lunch check.

11. A table was sold for $63 after a discount of 12½% had been deducted from the marked price. What was the marked price?

12. After a 20% discount had been deducted from its original price, a chair sold for $76. What was its original price?

13. Merchandise was reduced 25% and then sold for $360. What was the amount of the reduction?

14. A music dealer bought 800 phonograph records at 53¢ each, less 30% and 10%, terms 1/10, n/30. He took advantage of the cash discount. Express charges were $3.55. His selling expenses were 2½¢ per record. What was the dealer's profit per record if he sold them at 53¢ each?

15. A grocer bought 10 crates of lettuce, averaging 80 heads to the crate, for $6.40 per crate. Twenty heads of this lettuce spoiled and had to be discarded. The grocer sold the remaining heads of lettuce at 2 for 25¢. What per cent of profit, based on the selling price, did he make on the entire transaction, to the nearest tenth of a per cent?

16. Deering, a retail furniture dealer, bought a chair for $49, less 10%. He also paid freight charges of $2.45. His overhead expenses averaged 18% of sales. At what price should he sell the chair in order to make a net profit of 12% of the selling price?

17. An electric radiator heater is invoiced to a dealer at $80, less 20% and 10%. His overhead expenses are 25% of his sales.

At what price should he mark the heater to yield a profit of 15% on the selling price?

18. Whitaker, a household appliances dealer, plans to make a gross profit of 35% on the selling price of each article sold. At what price must he sell a stove costing \$130 in order to make the desired gross profit?

19. Elson buys fountain pens at \$40 per dozen, less 40%. His overhead expenses average 25% of sales. At what price should he sell each pen in order to make a net profit of 8⅓% of the selling price?

20. An electric appliance dealer buys refrigerators for \$180 less 20% and 16⅔%. At what price must he sell each refrigerator in order to make a net gain of 25% on the selling price if his overhead expenses average 15% of his sales?

21. A dealer pays \$60, less 30% and 10% for a rug. Selling expenses amount to 7½% of the selling price. He sells the rug to gain 25% on the selling price, after allowing a discount of 20% on the marked price. What is the marked price?

22. Sherman, a rug dealer, bought rugs for \$96 each, less 25% discount. He sold these rugs for \$105 each. What per cent of gross profit, based on the cost, did Sherman make on each rug, to the nearest tenth of a per cent?

23. Ackert, a luggage dealer, buys suitcases for \$40, and marks them up 25% on the cost. Added to the marked price is a 20% Federal tax, and a 2% local retail sales tax, each calculated on the marked price. What is the total cost of one of these suitcases to a customer?

24. Horton, a furniture dealer, had been buying chairs for \$35 and selling them for \$49. Recently the price Horton paid for this type of chair was increased to \$40. At what price must he sell chairs of this kind in order to gain the same per cent of profit on their cost?

25. An electric drill that cost \$50, less 20% and 10%, was formerly sold by a hardware store for \$48. The cost of the drill was increased to \$60, less 20% and 5%. At what price must the drill now be sold in order to make the same rate of profit?

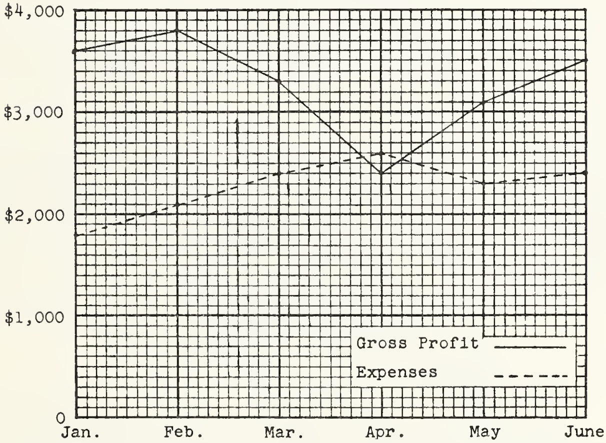
26. A merchant buys gloves at \$18 a dozen pairs. During a special sale he desires to offer a discount of 20% from the marked price and still make a profit of 33⅓% on the cost. At what price must each pair be marked?

27. Lewis bought 550 dresses for \$10.80 each, less 10%. He sold 475 of these dresses for a total price of \$6,750. At what price, to the nearest cent, must he sell each of the remaining dresses in order to make a gross profit of 40% on the cost of the entire 550 dresses?

28. A merchant bought a shipment of 250 men's coats at $24 each. He marked them up 25% on the cost and sold 170 of them at that price. At what price each were the remaining coats sold if the merchant made a gross profit of 20% on the cost of the entire transaction?

29. A retailer sold an article for $27, at a loss of 10% on the cost. What did the article cost the retailer?

30. The graph below shows the monthly gross profit and expenses of Thomas Jackson for the first six months of the current year.



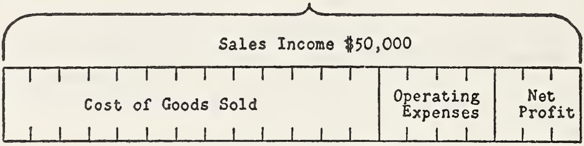
THOMAS JACKSON, GROSS PROFIT & EXPENSES

January–June, 19—

Using the information given by the graph, answer the following questions, showing all calculations.

(a) What was Mr. Jackson's profit for January? (b) What were his expenses for March? (c) What was his net profit for June? (d) In what month did he have a loss instead of a profit? (e) In what month was his net profit the greatest? (f) What was his net profit or loss for the entire six-month period?

31. Last year the sales income of the Jefferson Manufacturing Company was $50,000. The unit bar graph on the next page shows the relationship between this income and the cost of goods sold, operating expenses, and net profit.



(Each division mark represents $2500.00)

Using the information given by the graph, answer the following questions, showing all calculations.

(a) What per cent of the sales income was the cost of goods sold? (b) What was the amount of the gross profit, or margin, for the year? (c) What was the amount of the net profit for the year? (d) What per cent of the sales income was the net profit? (e) What was the amount of the operating expenses for the year?

32. Using the title and tabulated information, prepare a bar graph to show the facts in each of the following.

a. PHILIPS TAXI COMPANY
Passengers Carried
May 18–May 24

Sunday	78	Thursday	45
Monday	49	Friday	76
Tuesday	60	Saturday	94
Wednesday	53		

b. DAILY ATTENDANCE AT MUSEUM
May 25–May 31, 19 – –

Sunday	960	Thursday	430
Monday	350	Friday	690
Tuesday	420	Saturday	840
Wednesday	570		

c. ESTIMATED RESERVES OF OIL
(in billions of barrels)

United States	21	Venezuela	7
Russia	8	Iraq	5
Iran	7		

33. Using the title and information, prepare a curve or broken-line graph to show the facts in each of the following.

a. COMMISSIONS EARNED IN 19 – –

January	$390	March	$520	May	$350	July	$400
February	$460	April	$410	June	$430		

b. AVERAGE DAILY TEMPERATURES — APRIL 9–APRIL 15, 19 – –

Sunday	41 degrees	Thursday	44 degrees
Monday	36 degrees	Friday	50 degrees
Tuesday	27 degrees	Saturday	46 degrees
Wednesday	47 degrees		

UNIT XI

1. The Madison County Savings Bank holds a 6% mortgage for $90,000 on the office building of the Pleasant Valley Realty Company. The mortgage is dated October 1, 1952, with interest payable semiannually. The following checks were received: April 1, 1953, $12,700; October 1, 1953, $22,400; April 1, 1954, $31,800. What amount will be required to make final settlement in full on October 1, 1954?

2. Rogers & Blair discounted the following note at the bank on January 22, 1954:

$2,730.00

Gary, Ind., November 12, 1953

Four months after date *I* promise to pay to the order of

..........................*Rogers & Blair*.................

Twenty-Seven Hundred Thirty and 00/100............Dollars

Value received.

Fred H. Wilson

(a) Find the amount that the bank charged for discounting the note. (b) Find the amount that Rogers & Blair received.

3. On January 17, 1954, C. H. Foster's bank account in the Second National Bank was overdrawn $45.50. On that day he discounted the following note at the bank and had the net proceeds placed to his credit. Find the discount, the net proceeds credited, and the balance of the account after the deposit.

$550.00 *Fort Worth, Texas, September 1, 1953*

Six months after date *I* promise to pay to the order of........

................*C. H. Foster*...............................

Five Hundred Fifty Dollars, with interest at *6%*.

W. A. Barber

4. Billings had a balance of $583 in the bank. To obtain funds to pay for an invoice amounting to $852.50, terms 2/10, n/30, and to take advantage of the cash discount, he discounted at the bank, at 6%, his own 90-day non-interest-bearing note for $300 and received credit for the proceeds. What was Billings' bank balance after he had discounted the note and paid the invoice, less the cash discount?

5. On August 5 a merchant discounted a customer's 2-month, 4% interest-bearing note for $600. The note was dated July 26 and the discount rate was 5%. (a) When is the note due? (b) What is its maturity value? (c) What is the term of discount? (d) What is the bank discount? (e) Find the net proceeds of the note.

6. On April 7, Stevens discounted at his bank a customer's 2-month promissory note, dated March 17, and bearing interest at the rate of 5%. The face of the note was $2,400. The bank discount rate was 6%. (a) When did the note fall due? (b) What amount will the maker of the note have to pay on the date the note falls due? (c) How much did Stevens receive as net proceeds from the note on April 7?

7. On November 16, Mr. Dalton discounted the following note at his bank. The rate of discount was 6%. What amount did Mr. Dalton receive as proceeds from discounting this note?

$4,500.00 *September 7, 19--*

Ninety days after date *I* promise to pay to the order of

.....................*James Dalton*.......................

Four Thousand Five Hundred and 00/100..............Dollars

With interest at 4%. (Signed) *Thomas Underwood*

8. On June 12, Fred Harper discounted at his bank a customer's 90-day promissory note for $500 with interest at 5%. The note was dated May 19. The bank charged 6% discount. (a) When does the note fall due? (b) What amount will the maker of the note have to pay on the date the note falls due? (c) How much did Harper receive as the net proceeds of the note on June 12?

9. On May 13, Alvin Baxter discounted at his bank a customer's 60-day note dated April 25, bearing interest at the rate of 4%. The face of the note was $1,500. The bank discount rate was 6%. How much did he receive as net proceeds from the note?

10. The Domestic Rug Company received an invoice of rugs on November 10 amounting to $1,280, terms 3/10, n/60. To obtain the necessary funds, on November 20 the company discounted at 6% a customer's 60-day non-interest-bearing note for $1,251 dated October 31. (a) For how much did the company write their check to pay the invoice on November 20? (b) Find the net proceeds of the discounted note. (c) What was the net saving the company made by discounting the note and paying the invoice on November 20?

11. On December 5, Lenz & Company had a check book balance of $462.38. They wished to pay Maxson & Son for goods purchased on November 25 for $1,275, less 20% and 10%, terms 2/10, n/30. To raise additional funds for the bank account, they discounted Hale & Company's three-month interest-bearing note for $750, dated October 14. They then mailed their check to Maxson & Son. (a) For how much did Lenz & Company write their check in payment of the bill on December 5? (b) What were the proceeds of the note that was discounted at the bank? (c) What was the balance in the checkbook after the check was issued?

12. Morton's business failed and he went into bankruptcy owing debts of $11,480. The net cash to be distributed to his creditors was $8,150.80. How much was paid to a creditor with a claim of $2,200?

13. Mann went into bankruptcy, with liabilities totalling $95,840. The net cash distributed to his creditors was $62,296. What amount was paid to a creditor with a claim of $3,600?

14. Nicholson went into bankruptcy, owing a total of $19,860. The net cash distributed to his creditors was $9,334.20. What amount of money was paid to a creditor with a claim of $1,280?

15. Reeves, a bankrupt, owed debts totalling $12,800. The net cash that was available for his creditors was $7,552. What amount of money would have been paid to a creditor with a claim of $385?

16. A farmer sent to his commission merchant 850 bushels of potatoes to be sold. The agent sold 350 bushels at $1.75 per bushel, 275 bushels at $1.50 per bushel, and the remainder at $1.30 per bushel. He deducted 5% commission on sales, $18.50 for freight charges, and 1½¢ per bushel for storage. Find the amount remitted to the farmer.

17. Thomas, a farmer, sent 600 bu. of apples to a commission merchant to be sold. The merchant sold 200 bu. for $3.50 per bu., 150 bu. for $3.00 per bu., and the remainder for $2.80 per bu.

He charged Thomas $.20 per bu. commission. Freight, storage, and other expenses amounted to $31.85. What amount did Thomas receive as net proceeds for the sale of these apples?

18. Barnes employed a commission merchant to sell 600 bushels of apples for him. The merchant sold 250 bushels at $4.50 per bushel, 275 bushels at $4.10 per bushel, and the remainder at $4.00 per bushel. He charged Barnes 12% commission. Freight and other expenses amounted to $19.75. What average price per bushel, to the nearest whole cent, was remitted to Barnes by the commission merchant as net proceeds for the entire transaction?

19. Benton, a sugar broker, purchased 35,000 pounds of sugar for a candy manufacturer at 8.5¢ a pound. The broker's expenses and charges were: handling, $23.40; freight, 36¢ per cwt.; commission, 5%. (a) What was the total cost of the sugar to the candy manufacturer? (b) What was the cost per pound to the candy manufacturer? (Express answer to the nearest tenth of a cent.)

20. Groves hired a commission merchant to buy butter for his wholesale business. The merchant bought 1,600 lbs. at 62¢ per lb., 1,500 lb. at 58¢ per lb., and 1,100 lb. at 60¢ per lb. The rate of commission he charged Groves was 6%. Trucking charges were $11.50 and refrigeration $16. What was the average total cost per pound that Groves paid for the butter? (Answer to the nearest tenth of a cent.)

21. Malone engaged a commission merchant to buy potatoes for him. The commission merchant bought 300 bushels at $1.65 per bushel, 280 bushels at $1.50 per bushel, and 200 bushels at $1.48 per bushel. He charged Malone 5% commission on the purchase price. Freight and other charges amounted to $16.85. What was the total price Malone paid for the potatoes?

22. Davies bought 1,250 lb. of coffee through a commission merchant. The merchant paid 62¢ per lb. for 550 lb., and 67¢ per lb. for the remainder. He charged Davies 7% commission on the purchase price. Trucking and other expenses amounted to $11.85. What was the average total cost per pound which Davies paid for the coffee?

23. Foster employed a commission merchant to buy apples for him. The commission merchant purchased 450 bushels at $4.00 per bushel, 380 bushels at $4.25 per bushel, and 260 bushels at $5.40 per bushel. He charged Foster 8% commission on the purchase price. Storage and other expenses amounted to $27.48. What was the average total price per bushel which Foster paid for the apples?

UNIT XII

1. In producing 12,000 pairs of shoes to be sold to dealers at $4.50 a pair, raw materials cost $17,320, salaries and wages $19,068, overhead expenses $4,350, and selling expenses $4,262. (a) Find the total cost of making and delivering one pair of shoes. (b) Find the manufacturer's profit on the 12,000 pairs. (c) What per cent of the total manufacturing and marketing cost was the profit?

2. A machine that cost $1,200 when new has a trade-in value of $840 after 6 years of use. What is the average annual depreciation on the machine?

3. Holmes paid $390 for a machine. He estimated that this machine could be operated for 6 years, at the end of which time it would have a trade-in value of $60. What will be the estimated value of this machine after 4 years of use?

4. Carson paid $1,600 less 20% for a piece of machinery for his factory. He estimated that this machinery could be used for 16 years, at the end of which time it would have a trade-in value of $160. What would be the estimated value of this machinery after 7 years of use?

5. Two machines of like capacity are on the market. The first machine costs $12,000 and has a scrap value of $100 at the end of 4 years. The second machine costs $15,000 and has a trade-in value of $600 at the end of 6 years. Taking into consideration the average annual depreciation and interest at 4% on the amount invested, find (a) the total yearly cost of owning the first machine, (b) the total yearly cost of owning the second machine, (c) which machine is the cheaper to own, and (d) how much cheaper per year.

6. A factory owner is choosing between two machines with equal output. The first machine costs $2,000 and has a trade-in value of $300 at the end of 4 years. The second machine costs $2,400 and has a trade-in value of $500 at the end of 5 years. Considering average annual depreciation and 5% interest on the investment, find (a) the annual cost of ownership of the first machine, and (b) by how much the annual cost of ownership of the second machine will differ from that of the first.

7. The four departments of a certain factory occupy floor space as follows: carpenter shop, 1,700 sq. ft.; machine shop, 3,300 sq. ft.; paint shop, 1,500 sq. ft.; assembling department, 2,000 sq. ft. The yearly heating cost for the entire factory is $1,870. What amount should be charged to each department if this expense is distributed on the basis of the floor space that each department occupies?

8. A building has a total usable floor space of 51,000 square feet. The space used for various purposes is as follows:

Offices	17,000 square feet
Salesrooms	6,375 square feet
Retail stores	12,750 square feet
Storage	remainder of the space

(a) What fractional part (reduced to its lowest terms) of the total usable floor space is used for *each* purpose? (b) Expenses amounting to $6,000 are to be divided in proportion to the amount of floor space used for each purpose. How much should be charged to *each*? (c) Prove the correctness of your answers to part (*a*). (d) Prove the correctness of your answers to part (*b*).

9. The manufacturing cost of a certain article is as follows: factory expense, $6.25; materials, $28.50; labor, $16.50. A profit of 20% on the cost is desired. The selling expense amounts to 15% of the selling price. What must be the selling price?

10. What must be the catalog price of an article costing $11.34 so that the seller may allow a discount of 10% and still make a profit of $33\frac{1}{3}$% on the cost?

11. At what price should a manufacturer list an article that cost him $141.60 so as to gain $33\frac{1}{3}$% on the cost after allowing discounts of 25% and 20%?

12. An electric motor that cost $80 is so listed in a catalog that it can be sold at a profit of 40% on the cost after trade discounts of 20% and $16\frac{2}{3}$% are allowed. (a) Find the net selling price. (b) Find the catalog price.

13. Hall Brothers sell radios at $240, less $33\frac{1}{3}$%. What additional per cent of discount did they give on a sale where these radios were marked down and sold for $140?

14. A table that has been listed at $80.00 less 25% is to be sold for $48.00. What additional per cent of discount must be given?

15. Rogers and Company has been selling automobile heaters at $45. To meet competition, it is necessary to sell these heaters at $38.25. What rate of discount must Rogers and Company offer?

16. A manufacturer sold an article to a jobber at 12½% above the cost of manufacture. The jobber sold it to a retailer at 10% above the manufacturer's price. The retailer sold it for $14.85 at a profit of 25% above the cost to him. Find the cost of manufacture.

17. A certain fountain pen is advertised to sell at $4.50. At what price per dozen must these pens be sold to a dealer to allow him a profit of 60% on the cost?

18. The Vickers Machine Shop has been renting a building for their subassembly work at $300 a month. They can buy the building for $45,000. If they bought it, they could rent the upper floor for $90 a month and they would have the following annual expenses: insurance, $180; miscellaneous expenses, $115; taxes, $865; repairs estimated at 1½% of the cost of the building. If money is worth 5% to them in their business, how much would they gain or lose annually by buying the building?

UNIT XIII

1. Hoag and Woolsey are partners in a firm, with investments of $25,000 and $15,000, respectively. Profits are to be shared in proportion to the partners' investments. If the firm made a net profit of $9,600 during last year, what amount did Hoag receive as his share?

2. Billings, Chapin, and Carter are members of a partnership, with investments of $18,000, $24,000, and $27,000, respectively. Profits and losses are to be shared in proportion to the partners' investments. If the firm made a net profit of $18,860 during last year, what amount did Billings receive as his share?

3. Robinson and Byrne are partners in business, with investments of $64,000 and $36,000, respectively. Profits are to be shared in proportion to the partners' investments. The firm made a net profit of $24,320 last year. What was the amount of Robinson's share of this profit?

4. During last year, the partnership of Abbott and Warren had total sales of $316,846. The cost of the goods sold was $289,527. Operating expenses were $17,819. Abbott received 65% of the net profit as his share for the year. What amount of money did he receive?

5. (a) During last year, the Higbee and Allen Company sold goods for $210,929. The cost of the goods sold was $160,657. Expenses consisted of wages and salaries $11,684, depreciation and loss on bad debts $1,827, office expenses $5,729, taxes $7,962. What was the net profit?

(b) Higbee's investment in the firm was $80,000 and Allen's was $40,000. How much would Higbee receive as his share of the net profit if it were shared in proportion to the partners' investments?

6. (a) Albee and Johnston are partners in a firm. Albee's investment is $7,500 and Johnston's is $4,500. How much did Albee receive as his share of the 1953 net profit of $5,600 if it was divided in proportion to the partners' investments?

(b) In 1954, with the same investments as in 1953, the partners decided to allow a 5% return on their investments and to divide the remaining net profit equally. How much did Albee receive if the firm made a net profit of $3,750 that year?

7. Lind and Butler were members of a partnership, with investments of $26,000 and $18,000, respectively. The partnership agreement stated that the net profit was to be divided as follows: each partner is to receive 5% interest annually on his investment; the remaining profit is to be divided equally. The net profit for the firm for last year was $7,580. What amount of money did Lind receive as his total share of this net profit?

8. At the beginning of January last year, Stanwick and Paul formed a partnership, with investments of $35,000 and $25,000, respectively. The partnership agreement stated that the annual net profit would be divided as follows: each partner was to receive 6% interest annually on his investment; the remaining profit was to be divided equally. The net profit of the firm for last year was $17,850. What amount did Stanwick receive as his total share of this net profit?

9. On June 1, Kennedy, Lane, and Allen entered into partnership. Kennedy invested $10,000, Lane $15,000, and Allen $20,000. It was agreed that each partner should receive 6% annually on his investment and that the remaining profit should be divided equally among the partners. At the end of the year, the gross profit on sales amounted to $17,380 and other income, $1,470. The expenses for the year amounted to $5,050. (a) Find the firm's net profit for the year. (b) Find Kennedy's total income for the year. (c) Find Lane's total income for the year. (d) Find Allen's total income for the year.

10. Robinson and Alden are partners in a retail coal business, with investments of $20,000 and $10,000, respectively. During last year, the firm's net sales were $116,539. The cost of the merchandise sold was $70,312. Operating expenses were $35,827. The partnership agreement provides that the net profit is to be divided as follows: first, each partner is to receive 4% interest on his investment; then the remaining profit is to be divided equally. What amount of money should each partner receive as his total share of the net profit for the year?

11. Stevenson, Adams, and Riley are partners in a retail furniture store, with investments of $25,000, $35,000, and $40,000, respectively. In one year the firm made a net profit of $14,910. (a) What would Stevenson receive as his share of the net profit for the year if it were divided equally among the three partners? (b) What would Stevenson receive as his share of the net profit for the year if it were shared in proportion to each partner's investment? (c) What would Stevenson receive as his total income from the business if the partners decided to allow a 6% return on their investments and to divide the remainder of the net profit equally?

12. A, B, and C are partners in a business that showed a net profit of $11,356.70. A's investment is $12,000; B's, $18,000; and C's, $24,000. The balance of the net profit was divided equally among the partners, after each partner was paid 6% interest on his investment and $500 was reserved for contingencies that might arise. (a) Find the share of the balance of the net profit that each partner received. (b) Find the total income that each partner received.

13. In the Precision Products Company, Abbott invested $12,000, Johnson $16,000, and Moore his services. Out of the first year's profit of $9,675, Abbott and Johnson each were allowed $12\frac{1}{2}$% on their investments, and Moore $1,600 as salary. The remaining profits were divided equally among the three partners. (a) Find Abbott's total income for the year. (b) Find Johnson's total income for the year. (c) Find Moore's total income for the year.

14. Young and Harrington invested $6,000 and $12,000, respectively, in a wholesale fruit business. The sales for the year totaled $28,450 and the following charges were incurred: cost of fruit sold, $15,460; taxes, $324; delivery expense, $1,240; wages and salaries, $4,800; miscellaneous expense, $926. (a) Find the net profit of the partnership. (b) The profit is to be shared in proportion to the respective investments. How much will Harrington receive as his share? (c) If each partner were allowed 6% on his original investment, with the remaining profit to be shared equally, how much would Harrington receive as his total share of the profit?

15. Adams & Ford are paying $6,600 rent annually for the first floor and basement. They have the opportunity to buy the building for $82,000. Adams & Ford estimate that they could receive a total of $5,500 in annual rent for the other three floors and that they would have the following expenses: taxes, $1,450; insurance, $240; heat, $700; repairs, $500; elevator service, $1,250; janitor service, $1,100. If money is worth 6% to the firm in their business, would they gain or lose and how much by purchasing the building?

16. A corporation, with outstanding capital stock of $200,000 (par value $100 per share), earned a profit of $43,856 for the year. A dividend of 9% was paid to stockholders. The remaining profit was kept in surplus. (a) How much was kept in surplus? (b) What amount of dividend was received by a stockholder who owned 37 shares of stock? (c) If the stock cost him $81 per share, what rate of income did he receive on his investment?

17. (a) Logan, Hart, and Jackson were partners in a garage business, with investments of $4,000, $8,000, and $12,000, respectively. At the end of one year the net profit was $4,680. Each partner received 6% on his investment and the remaining profits were shared equally. What was Logan's share of the profit?

(b) At the beginning of the next year, the partnership was changed to a corporation. Logan received 80 shares of stock as his ownership in the corporation. During that year the company paid four dividends of $4.50 each per share. How much more income did Logan receive from the business in the latter year than in the former year?

18. The Peerless Corporation had capital stock consisting of 500 shares of preferred stock paying 6% dividends, and 500 shares of common stock. The par value of each type of stock is $100 per share. A dividend of $7,000 is to be paid the stockholders. After the dividends have been paid to the preferred stockholders, how much will be paid as the dividend on each share of common stock?

19. The Excello Corporation has capital stock consisting of 1,000 shares of preferred stock, paying 5% dividends annually, and 500 shares of common stock. Each type of stock has a par value of $100 per share. Last year a dividend of $8,000 was paid to the stockholders. How much was paid to Steele, who owned 10 shares of preferred stock and 25 shares of common stock?

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